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C A T A L O G U E
OF THE
F I S H E S
OF THE
EASTERN COAST OF NORTH AMERICA,
FROM
GREENLAND TO GEORGIA.
BY
THEODORE GILL.
JANUARY, 1861.

INTRODUCTION.

About fourteen years have now elapsed since the publication of Dr. D. H. Storer's "Synopsis of the Fishes of North America."* That work is the last, and, indeed, almost the only special work that has ever been published, professing to give a complete enumeration of the various species of fishes which have been described as inhabitants of the waters that bound, or course through, our continent. During the interval that has elapsed between its composition and the present day, the progress of Ichthyology, in common with every other branch of Natural Science, has been such, that the "Synopsis of the Fishes of North America" presents a very inadequate view of the present condition of our knowledge. It appeared desirable that a list of the numerous species described in various special works and the Transactions of learned societies should be published, in order to exhibit the extent of our Fauna. The following Catalogue has therefore been prepared, and is believed to be a close approximation to the correct nomenclature of species of our coast.

Dissatisfied with all the existing schemes of classification, we have not strictly adhered to any one, as will be sufficiently evident on examination of the Catalogue. The following arrangement approximates most nearly to that of the late celebrated and learned Johannes Müller, but the orders of *Pharyngognathi*, *Anacanthini* and even *Malacopteri* have been rejected as such, they having apparently no real existence in nature; for convenience of classification, some have been retained as suborders.

We † have already remarked on the close affinity of several genera of the Müllerian *Pharyngognathi* to others of that biologist's *Acanthopteri*; we have cited the mutual resemblance of *Pterophyllum* of Heckel and *Platax*; of *Astronotus* of Swainson and *Lobotes*, and of *Amblodon* ‡ of Rafinesque and *Corvina*, and have remarked that Cuvier had even regarded the respective analogous genera as identical, while the Müllerian classification would refer them to different orders. We may further remind the reader of the very close affinity of the Pseudochromoids to the true Chromoids, and that *Malacanthus*, which has by all naturalists been

* "A Synopsis of the Fishes of North America," by David Humphreys Storer, M. D., A. A. S. Cambridge, 1846: *ib.* in "Memoirs of the American Academy," vol. ii.

† "Notes on a collection of Japanese Fishes, made by Dr. J. Morrow," by Theo. Gill, in Proc. Acad. of Natural Sciences, for 1859, p. 148.

‡ "Notice of a collection of Fishes from the southern bend of Tennessee river, in the State of Alabama," by L. Agassiz, in American Journal of Science and Arts, second series, vol. xvii. p. 307.

admitted as a true Labroid, differs from the other genera of that family by the separation of the inferior pharyngeal bones, and would therefore be an Acanthopteran of Müller, and consequently a member of a different order from the Labroids.

But even if the Labroids, the Pomacentroids and the Chromoids are ordinarily distinct from the Acanthopteri, they can scarcely be considered as natural associates of the Scomberesocoids, which have, by Müller, been placed in the same order, but under a distinct suborder. The Scomberesocoids appear, indeed, to be much more nearly related to the Scombroids and their allies than to any other members of the class. This relation we perhaps see more strongly in the genus *Scomberesox* than any other, but in all it is quite apparent. The pinnules or false finlets of *Scomberesox* above and below the caudal peduncle remind us at once of the true Scombroids. The structure of the scales, the mode of squamation, and the lateral carina add to the likeness. We even see an analogous instance of the prolongation of the maxillaries, nasal and frontal bones, to form a beak in the family of Xiphioids, which, by all naturalists, have ever been regarded as very near allies of the Scombroids, and by many as belonging to the same family.

The Aulostomoids have also many characters in common with the Scomberesocoids, and should be apparently classed near them. To those who object, on account of the different nature of the fin rays, to the likeness of *Scomberesox* and the Scombroids as not being indicative of affinity, we would refer to the well known *Solenostomi* (*Channorhynchi* of Cantor or *Fistulariæ* of Linnæus.) Those fishes are as totally destitute of spines as any of the Scomberesocoids, and yet no naturalist can overlook their affinity to the *Aulostomi* of Lacepede or *Polypteryichthys* of Bleeker, each of which have a number of spines before the rayed dorsal fin, and are thus, if we look to single characters only, truly referable to the Acanthopteri. But why need we say anything on the futility of an ordinal classification, based on the nature of the rays alone? It is only necessary to mention the *Ichthyoscopi* of Swainson and *Leptoscopi* and *Dactyloscopi* of Gill among the Uranoscopoids; the *Aspidophoroides* of Lacepede among the Agonoids; the genus *Gobiopus* of Gill, and others among the Gobioids, and the whole family of Pseudochromoids. Convinced, then, that the nature of the rays alone is not sufficient to determine the affinities of fishes, and as there are no important anatomical differences, we have approximated both the Aulostomatoids and the Scomberesocoids to the Scombroids, as well as the Echenioids, which are related to the same fishes through means of Elacates.

To those who refer to the abdominal position of the ventral fins, as an argument against the affinity of *Scomberesox* and the Scombroids, we point to the same Aulostomoids, to the Sphyrænoids, the Atherinoids, and Campylodontoids, and perhaps the Gasterosteoids.

The likeness of *Scomberesox* to the Scombroids has already been

alluded to by Professor Agassiz, who has remarked on the similarity of the finlets of that genus and the Mackerels. Lacepede has himself perpetuated his appreciation of the same resemblance in the name which he has given to the group. Agassiz has also adverted to the affinity of *Echeneis* to *Elacates*—an affinity which has been also recognized and insisted on by Holbrook* and very recently by Günther.†

The Cottoids and other Sclerogenoids have been removed from the station assigned to them by most naturalists, and are now placed after the Scombroïd and before the Blennoid group. The distinction between the formidably armed Sculpins (*Acanthocottus*) and the typical Blennoids, defenceless and almost totally destitute of robust spines, is indeed great, but there is still an evident likeness between them. There is also a strict gradation between the almost Percoid-looking *Sebastes* to the loose-set Blennoid through the long chain of striking forms which have been ranged in the respective families of Sclerogenoids and Blennoids.

From the Blennoids, the passage to the Cod fishes appears to be also gradual. This likeness has been recognized by several of the older naturalists, who have referred Blennoids to the old "genus" *Gadus*, and Gadoids to *Blennius*. The late Prince of Canino‡ had even placed the common "Toad fishes" (*Batrachus*) of the Americans in a group which he has called the order "Gadi," and in which he has also included the Leptocephaloids, Ammodytoids, Ophidioids, Macrurroids, Gadoids and Bibronioids. Nor does the approximation of those fishes to the Gadoids appear very unnatural. There is some likeness between the *Batrachi* and *Raniceps*, but perhaps there is more actual affinity between them and the *Uranoscopoids*, and in the vicinity of the former, we have, at least provisionally, accordingly retained them, thus adopting the views first announced by Agassiz, and recently reaffirmed by Girard. The *Uranoscopoids* themselves are obviously connected with the Synanchoid genus *Trachicephalus*§ of Swainson, and through them with the other Sclerogenoids. The remarkable genus *Dactyloscopus* of Gill shows the affinities of the *Uranoscopoids* to the Blennoids.

This is not the proper place to enter more fully into the affinities of the smaller groups. We turn to the larger.

Müller|| has divided the class of fishes into six subclasses, characterized

* "Ichthyology of South Carolina," by John Edwards Holbrook, M. D. 4to. Charleston, 1855, (p. 104.)

† On the History of *Echeneis*, by Dr. Albert Günther, in "The Annals and Magazine of Natural History," 1860.

‡ "Catalogo Metodico dei Pesci Europei di Carlo L. Principe Bonaparte," Napoli, 1846.

§ This name cannot be retained, as it had been previously applied to a valid genus of Saurians. The name of *Uranoblepus* may be conferred on it. A new species from China is in the collection of the North Pacific Exploring Expedition, and was collected by Dr. Stimpson.

|| "Ueber den Ganoiden und den natürliche System der Fische," and various other Memoirs, by J. Müller.

by differences observed in the vascular and nervous systems. Four at least of these are very distinct, and Agassiz* has recently even suggested that they are entitled to rank as classes, basing his opinion chiefly on the difference of development in each group.

Representatives of five of the subclasses of Müller are found on the Eastern shores of North America. In accordance with the suggestion of Prof. Baird, a synopsis is given of the most obvious and important characters of each.

Subclass TELEOSTEI Müller.

The first subclass has been named TELEOSTEI by Müller. The endo-skeleton is almost always osseous. The scapular arch is suspended from the skull; the supra scapula generally connected with the mastoid and paroccipital bones. The exo-skeleton is generally in the form of cycloid or ctenoid scales, but sometimes the body is naked and sometimes covered with bony scales, plates or spines. The optic nerves cross each other in their passage from their respective lobes to the eyes. The *bulbus arteriosus* has almost always only two opposite semilunar valves. The branchial apertures are represented by simple fissures on each side. There are four pairs of true and well developed branchial arches, each of which generally supports free branchiæ. An air-bladder is generally present. The ventral fins vary in position and are sometimes absent.

This subclass embraces by far the largest proportion of existing fishes. If we consider the Plectognaths, the Lophobranchiates and the Siluroids, as members of the group, we may divide it into five natural and easily distinguished orders. Agassiz considers the three orders above mentioned as perhaps more nearly allied to the Ganoids. For the present, we prefer to retain them among the Teleostei.

The orders may be thus characterized :

Order TELEOCEPHALI Gill.

The endo-skeleton is almost always perfectly developed. The body is generally covered by ctenoid or cycloid scales. The branchiæ are pectinated. The supramaxillaries and intermaxillaries are always present and separated from each other.† The subopercular bone is almost invariably present.‡ Many of the rays are articulated and branched.

This order embraces the largest number of recent fishes, and is cosmopolitan in distribution. Almost all of the fishes most esteemed as food belong to it.

It is divisible into several suborders.

* "Contributions to the Natural History of the United States of America, by Louis Agassiz." Boston, 1857, vol. i.

† In the family of Mormyroids, the intermaxillary bones are united, but they are distinct from the supramaxillaries.

‡ It is absent in the Notopteroids.

Suborder PHYSOCLYSTI* (Bon.)

The scales, when present, are either ctenoid or cycloid; there are rarely osseous plates. The anterior rays of the dorsal and anal fins, and the first ray of the ventrals are simple or spinous. The ventrals are generally more or less anterior. The lower pharyngeal bones are small and triangular, sometimes united, but generally distinct; the teeth are implanted on the plane surface. The air-bladder never has a duct communicating with the intestinal canal.

The group for which we have retained Bonaparte's name of Physoclysti corresponds nearly to the Acanthopterygians, and jugular Malacopterygians of Cuvier, and to the Acanthopteri, Pharyngognathi and Anacanthini of Müller, the Pleuronectoids being omitted. The differences between those respective groups is so slight, and there is such an obvious similarity between some genera of each that we cannot believe their distinction is founded in nature. We have retained, with Cuvier and Müller, the Pharyngognathan families of Acanthopterygians at the end of the present suborders, but their affinities are probably rather with the Sciaenoids, the Chaetodontoids, and even the Percoids. There is indeed a very strong resemblance between the Chromoid genera, *Cichlasoma* of Swainson or *Acara* of Heckel, and *Geophagus* of Heckel and the Percoid Sunfishes (*Pomotis* of Rafinesque†) and *Centrarchi*.

Suborder HETEROSOMATA‡ Bon.

The chief distinctive feature of this group consists in the unsymmetrical body, the eyes being on one side of the head, and the mouth more or less distorted. The side on which the eyes are situated is dark or variously colored, while the eyeless is almost always white. The scales are either ctenoid or cycloid. The dorsal and anal fins are very long, and composed mostly of articulated rays. The ventrals are jugular. There is no air-bladder.

This suborder was first recognized as an order by Prince Bonaparte. It embraces the well known "Flounders" and "Flat-fishes" of our coasts.

Suborder PHYSOSTOMI (Müller.)

The scales are generally cycloid, almost the only exceptions occurring

* Derived from *φύσα*, bladder, and *κλειστός*, closed, in allusion to the absence of a duct communicating between the air-bladder and mouth, or intestinal canal.

† Ichthyologia Ohiensis.

‡ Heterosomes *Dumeril*, Zoologie Analytique ou Méthode Naturelle de classification des Animaux, Paris, 1806, p. 132, 133.

Heterosomata *Bonaparte*, Catalogo Metodico dei Pesci Europei, 1846, p. 6.

Dumeril regarded the group as a family.

in the genera *Luciocephalus* of Bleeker,* *Percopsis* of Agassiz,† and some Characins‡ where all or some of them are ctenoid. The fins are mostly sustained by branched rays, only the first rays being sometimes simple. The ventral fins are always abdominal. The lower pharyngeal bones are separated, and almost always small and triangular, with the teeth on a plane surface. The air-bladder communicates by a duct with the mouth or intestinal canal.

This suborder is almost co-equal in extent with the *Physostomi* of Müller, the *Cyprinoids* being alone withdrawn. It embraces on our own coasts, the Salmonoids, Clupeoids and similar fishes.

Suborder EVENTOGNATHI Gill.

The body, with only three exceptions, is provided with cycloid scales.§ All the rays of the fins, except the first of each, are branched. The ventrals are always abdominal. The lower pharyngeal bones are of a more or less falciform shape, greatly developed, nearly parallel with the branchial arches, and provided on the internal surface of the curved por-

* "Natuurkundig Tijdschrift voor Nederlandsch Indie," vol. i. p. 273, vol. iii. p. 99.

† "Lake Superior; its physical character, vegetation and animals," &c., by Louis Agassiz, Boston, 1850, p. 284.

‡ Prof. Baird ("Iconographic Encyclopædia of Science, Literature and Art," translated from the German of Heck, N. Y., 1851, vol. ii. p. 212) has indicated the affinity of *Percopsis* with the Characins.

§ In a species preserved in the Museum of the Smithsonian Institution, nearly allied to the *Xiphostomas* of Spix, and especially to the *Xiphostoma kujeta* of Valenciennes, the scales are covered with numerous closely approximated ridges abruptly commencing at the bases of their exposed surfaces, and terminating in as many strong teeth on the posterior margin. Valenciennes has not described the structure of the scales in the species of *Xiphostoma* known to him. But he as well as Müller and Troschel in the "Horæ Ichthyologicae," have mentioned them as being of moderate size. The ridges and pectinated margins of those of our fish are so strongly marked that it is scarcely possible that they should have been overlooked, if they occurred in the species known to the very excellent naturalists above mentioned.

The dorsal fin of our fish is more posterior than in the typical *Xiphostomas*, being above the anal; the anus is under the anterior rays of the dorsal. In this respect it resembles *Xiphostoma maculatum* and *X. kujeta* of Valenciennes.

Three specimens of the species were collected at Truando, by Mr. Arthur Schott on Lieut. Michler's Expedition to the Atrato river. They will be described under the generic name of *Ctenolucius*. It must remain undecided whether the two species of *Xiphostoma* of Valenciennes, agreeing in the position of the dorsal and anal fins, are really congeneric.

The scales of the common "mossbonker" or "menhaden" (*Brevoortia menhaden* Gill,) and other allied species have also the margins of the scales more or less pectinated. Most of the scales of the Cyprinodont genus *Luciocephalus* of Bleeker or *Diplopterus* of Gray are also ctenoid.

§ The body is destitute of scales in the American genus *Meda* of Girard, and the very characteristic European *Aulopyge* of Heckel. But one species of each is known. The typical species of *Phoxinellus* are also scaleless.

tion with large teeth of various forms. The air-bladder is divided by constriction into two or three portions, and communicates by a duct with the oesophagus.

If the pharyngeal bones are of any value in classification, the Cyprinoids appear to be entitled to distinction as a suborder of the Teleostei. The differences between the form of the pharyngeal bones of this group and those of the Acanthopteri seem to be certainly of much greater value than the difference between those of the latter and the Pharyngognathi. The form in both of those are the same, and the only difference is the separation or coalescence of the lower bones. The pharyngeal bones of the Cyprinoids, on the contrary, have a very different form from those of either of the other orders. Other anatomical peculiarities appear to justify us in the separation of the group from the other Physostomi of Müller. We have accordingly bestowed on it the name of Evenognathi in allusion to the development of the pharyngeal jaws.

No true marine representatives of the Cyprinoids can be said to exist. The *Hudsonius amarus* of Girard,* *Leuciscus chrysopterus* of Dekay,† a fish of doubtful genus, and some of the Northern Catostomi‡ are found in brackish or salt water, but they can only be regarded as exceptional examples, and scarcely as true marine fishes. They have consequently been excluded from our catalogue.

Order *APODES* Kaup §

The body is always anguilliform, or extremely elongated; the skin is generally naked, rarely covered with minute scales imbedded in the epidermis. The branchiæ are pectinated. The supramaxillaries and intermaxillaries are small or rudimentary. Teeth are planted on the palatine and vomerine bones. With the vomer, the nasal and ethmoid bones are coalescent.¶ The ventral fins are always absent; the pectorals often; the

* "Researches upon the Cyprinoid Fishes inhabiting the fresh waters of the United States west of the Mississippi valley, from specimens in the Museum of the Smithsonian Institution. By Charles Girard, M. D.," p. 46, *ib.* in Proc. of the Acad. of Natural Sciences, 1856.

† "Zoology of New York, or the New York Fauna," by James E. Dekay. Part iv. Fishes, p. 211, pl. xxx. fig. 95.

‡ Note in the Ichthyology of the voyage of the Erebus and Terror, by Sir John Richardson, p. 58.

The *Rynchana Greyi*, mentioned by Sir John as an instance of a purely marine representative of Cyprinoids, is a member of a very different family (Gonorhynchoidæ Val.) and belongs to the genus *Gonorhynchus* of Gronovius, as was afterwards acknowledged by its describer.

§ Catalogue of the Apodal Fish, in the collection of the British Museum, by Dr. Kaup, Professor of Natural History, Darmstadt, London, 1856.

Article "Ichthyology," by Sir John Richardson, in the recent edition of the "Encyclopædia Britannica."

Ichthyology of the Erebus and Terror, by Sir John Richardson, pp. 78, 114.

¶ The skull of the representatives of the genus *Muraena* is thus described by Sir John Richardson:

dorsal, anal and caudal fins, when present, are always confluent; their rays are simple.

This order embraces the "Eels" and "Congers." The Electrical Eel (*Gymnotus *electricus* Linn.) and the allied forms are excluded from the order as they are true Teleocephali. In that order, there are many genera characterized by an elongated form and the absence of ventrals, but none in which there is the union of characters indicated in the foregoing diagnosis. In the present order alone is the absence of ventrals a permanent feature.

Order *LEMNISCATI* Kaup.

This is a small order of doubtful affinity, and is composed of small fishes which are destitute of ventral fins, and which are generally diaphanous, greatly elongated and much compressed or ribbon-formed. An exception is seen in the genus *Helmichthys* of Rafinesque, in which the body is vermiform or subcylindrical. The skull and vertebral column are incomplete and cartilaginous. The blood is colorless, and there is no spleen. The

"Ossa cranii valida, solida, multa per anchylosin coalita. Ossa premaxillaria maxillæque desunt. Os nasi cum vomere ethmoideque in unum coalitum, dentiferum, munus ossium premaxillarium sustinens; os palati antice ad columnam orbitæ anteriorem ossi nasi per symphysin inhærens, postice per tendinem pedicello imo mandibulæ connexum; cumque osse nasi rictum oris superiorem conficiens. Mandibula longa, occiput posticæ æquans vel transiens. Ejus pedicellum tympanicum os unicum, validum, triangulare in latere cranii late inhærens."

Richardson remarks that the nomenclature of the bones of the skull of these fishes is a subject of no little difficulty, and he has gladly availed himself of that proposed by Professor Owen in his Lectures on the Vertebrata.

* The Gymnotoids are remarkable for the advanced position of the anus, which is under the throat, and in the typical species of *Rhamphichthys* (Müller and Troschel) even before the eyes and between the limbs of the lower jaw. But the advanced anus is not peculiar to those fishes. It also occurs in the Aphredoderoids, and the Hypsæoids, both of which are North American forms. The latter have now at least two, and perhaps three distinct genera—*Amblyopsis* of Dekay, blind and provided with ventral fins; *Chologaster* of Agassiz, with eyes, but without ventral fins; and *Typlichthys* of Girard, appearing to differ from *Chologaster* only by its rudimentary eyes. It may be doubted whether the last two are distinct.

They bear nearly the same relation to each other that the "crawfish" of the Mammoth cave does to the numerous species found in our streams. Yet no carcinologist has attempted to generically distinguish the one from the others. All are for them true *Cambari*. There is an atrophy of a single organ; all other parts of their organization are similar. The single modification is adapted for a special purpose; to fit them for a peculiar habitat; there is no need of the organs or the sense, and they have been therefore withheld from them. As the modification is determined by habitat and not independent of it, it has scarcely a generic value unless accompanied by some other peculiarity.

Bourguignat in the "Revue et Magazin de Zoologie" for 1856, (vol. viii. p. 499) has established a genus, which he has named *Zospeum*, for a group of terrestrial Gastropod Mollusks peculiar to the caves of Central Europe. Its species had been previously by most naturalists referred to *Carychium*.

body is entirely naked, and the arrangement of the muscles is very apparent.

It is very doubtful whether this order truly belongs near to the preceding orders, and it is only provisionally retained here. By Sir John Richardson, in the valuable essay on "Ichthyology," in the *Encyclopædia Britannica*, it is placed as a third suborder of the Dermopteri of Owen. Until it is better known, we prefer to retain it among the Teleostei, to which, notwithstanding the rudimentary condition of its organization, it appears to be more nearly allied. Sir John Richardson referred it to the Dermopteri on account of the "absence of ossification in the skeleton, the gelatinous condition of the sheath of the spinal marrow, which, in the form of a 'chorda dorsalis,' reaches into the base of the skull, and the persistence of the primordial cartilaginous cranium."

A single species, the *Leptocephalus gracilis* of Storer, is found on our coast.

Order *NEMATOGNATHI* Gill.*

The body is either naked, or protected by ganoid plates. The branchia are pectinated and supported on four arches as in the Teleocephali. The supra-maxillary bones are little developed, and are enveloped in the integuments which terminate in longer or shorter barbels. The subopercular bone is always absent. The rays are mostly articulated and branched.

This order embraces the "Catfishes," "Horn-pouts" and "Bull-heads" or *Ictaluri*† of North America. It embraces five families, and about one hundred and thirty or forty genera, which are chiefly represented in Asia and South America.

He has remarked on the general absence of sight in those animals found in caves and localities from which the light is excluded, and concludes that the want of that sense is of generic importance. While we are disposed to believe in the validity of the genus established by him, we can scarcely coincide in his views. The modification of a single organ dependant on the mode of life, we cannot yet regard as by itself of generic importance. But in most cases, such a modification is accompanied by others, and in conjunction with them, it assumes a systematic value.

These remarks have little relation to the subject in hand, but we have been naturally, although unintentionally, led to them, and think it advisable to retain them.

*"Ichthyologiæ Archipelagi Indici Prodomus, auct. P. Bleeker," vol. 1. *Siluri*; *Ib.*, in "Acta Societatis Scientiarum Indo Nederlandicæ," vol. iv. 1858, is a valuable monograph of the order.

†Rafinesque first named and well defined the group of fresh water "Catfishes" of North America, conferring upon them the subgeneric name of *Ictalurus*, and dividing that subgenus into sections, some of which are of generic value. We admit four, *Ictalurus*; *Amiurus*, of which the common catfishes of the eastern streams are representatives; *Hopladelus*, and *Noturus*. These genera will be described and illustrated in the forthcoming report of Captain Simpson, U. S. A.

Order *PLECTOGNATHI* Cuv.

In this order the internal skeleton is less perfectly developed than in the Teleocephali. The exterior is covered with ganoid plates, granulations or spines. The supramaxillary and intermaxillary bones are united together into a continuous piece. The branchiæ are pectinated; the branchial apertures small. The air-bladder has no duct.

In this order the Diodontoids and Tetraodontoids, popularly called "Puffers," "Blowers" and "Balloon fishes," and the Balistoids or "Trigger fishes," are included.

Order *LOPHOBRANCHII* Cuv. (Kaup.)*

The internal skeleton is less perfectly developed than in the Pectini-branchiata. The external skeleton is composed of polygonal plates, of an osseous and corneous structure, and which are joined to each other, but permit considerable mobility in the animal. The jaws are produced into an elongated tubular mouth. The branchiæ are tufted; the branchial apertures small and on each side of the nape. The air-bladder has no duct communicating with the intestinal canal.

This order embraces representatives of only two genera on our coasts, the well known "Pipe-fishes" and "Sea-horses," or the *Syngnathi* and *Hippocampi* of naturalists. In the tropical, and especially the Asiatic seas, the order is represented by quite a large number of genera and species, which have been distributed by modern systematists among three decidedly distinct families.

Subclass GANOIDEI (Agassiz) Müller.

The subclass of the GANOIDEI or Ganoids, as revised by Müller, embraces forms in which the vertebral column and skull are either osseous or cartilaginous. The scapular arch is directly suspended from the skull. The exo-skeleton is generally deposited in the form of ganoid plates, but there are, in representatives of some families, oval or cycloid scales, and the body is still more rarely naked, and the bony plates absent. The optic nerves, like those of the Plagiostoms, are only connected by commissure and do not decussate. The *bulbus arteriosus* is muscular, and provided with two or more rows of valves, which in one order are replaced by two spiral and longitudinal valvular folds. The intestine has frequently, but not always, a spiral valve. There are no special intromittent organs. The branchial apertures are simple fissures or spiracles on each side, as in ordinary fishes; the branchiæ are free. An air-bladder is present, and communicates by a duct with the intestinal canal. The ventrals are abdominal.

*"Catalogue of Lophobranchiate Fish in the collection of the British Museum. By J. J. Kaup, Ph. D. &c." London 1856.

Article "Ichthyology" by Sir John Richardson, in the recent edition of the "Encyclopædia Britannica."

This subclass embraces, according to the views of Agassiz and Müller, the recent sturgeons and the gar-pikes, and the *Amias* of the fresh water streams and lakes of America.

The subclass of Ganoids, as here restricted, is one of the most interesting divisions of the class of Fishes. Some of its representatives are so nearly similar in external form and appearance to true fishes or Teleostei, that a naturalist, unacquainted with the anatomical characters of the species, might well be excused for considering them as members of the same family. Such are the *Amiæ* of North America, and the Erythrinoids of South America. The former have the optic nerves connected by a simple commissure and not decussating, and the *bulbus arteriosus* furnished with many valves; it is, therefore, a true Ganoid. The Erythrinoids exhibit decussating optic nerves, and a single pair of opposite valves in the *bulbus arteriosus*; they are, consequently, true fishes or Teleostei. Yet in external characters, there is a very strong resemblance between them, and they were indeed placed next to each other and in the same family by Cuvier. *Amia* is provided with a sublingual bone, but this is not a character peculiar to the Ganoids; for the family Elopoidæ, composed of the genera *Elops* of Linnæus and *Megalops* of Lacepede, is distinguished by the presence of a similar bone. Professor Agassiz has indeed expressed an opinion that, on account of the structure of the scales, and on other grounds, the genus *Megalops* may be a member of his order of Ganoids. The reasons for arriving at such a conclusion have not been given by him. One reason might well be the presence of such a sublingual bone, especially if, as appears to be the case, such an appendage is peculiar to the Elopoids among the subclass of Teleostei. And there is, indeed, no very inconsiderable resemblance between the Elopoids and the species of some of the families of Holostean Ganoids which have no living representatives. Such are the Leptolepoids, which are generally regarded as true Ganoids. But unless the Elopoids have the structure of the brain and the simple chiasma of the optic nerves as well as the two or more rows of valves in the *bulbus arteriosus*, they cannot, without a new conception of the characters of Ganoids, be referred to that subclass.

In other forms, characters are seen which indicate their affinity with the Amphibians and Reptiles; traits which were formerly supposed to be peculiar to those classes have now been found in representatives of this subclass of fishes. The most singular and remarkable of those types are the paradoxical *Lepidosirenes* of South America, and *Protopteri* of Africa. The former were first described by Fitzinger and Natterer as amphibian reptiles, most nearly allied to the Sirenoids of North America; the latter, first named by Owen *Protopteri*, and afterwards, on the publication of the memoir of Fitzinger, referred to the genus *Lepidosiren*, were placed among the fishes. The rank and affinities of those animals have since attracted much attention from naturalists, and besides the eminent ones above-mentioned, the accomplished anatomists and zoologists, Bischoff,

Milne-Edwards and Müller have added to our knowledge of their organization, and each has discussed their affinities from various points of view.

Although such learned biologists as the Professors Bischoff and Milne Edwards have believed in the accuracy of the reference of the Lepidosirenoids to the Amphibian reptiles, the greatest number of zoologists has regarded them as true fishes. The first of these are undoubtedly Owen and Müller, each distinguished by the most profound knowledge of the anatomy and characteristics of the classes of the Vertebrata.

Professor Owen, in the "concluding observations" of his admirable memoir of the *Lepidosiren annectens*, has fully reviewed the relations of that species, and has pronounced an unqualified belief in its piscine affinities. He has shown that it is proved to be a fish, "not by its gills, not by its air bladders, not by its spiral intestine, not by its unossified skeleton, not by its generative apparatus, nor its extremities, nor its skin, nor its eyes, nor its ears, but, simply, by its nose." In all of its characters, except the last, it agrees with some of the lower Amphibians. He yet warns the student "that the physiological consequences of the modifications of the nasal cavity, above alluded to, would have been far too insignificant to have established the ichthyic nature of the *Lepidosiren*, if, with coexistent gills and lungs, the modifications of the other organic systems had agreed with those of the Perennibranchians instead of with those of Fishes." As his remarks that follow are pertinent to the subject of the present memoir, we take the liberty of quoting them:—

"For, although it be true, that the fish-like modification of any single system is insufficient of itself to determine the removal of the *Lepidosiren* from the *Amphibia*, in which it has hitherto been placed, to the class of Fishes, yet it is impossible to avoid arriving at that conclusion, when we consider the concurrence of ichthyic characters in so many parts of the organization of this most interesting species. The combination of cycloid scales, mucous ducts, quasi-fins, supported each by a many-jointed ray, a gelatino-cartilaginous vertebral style united to the whole surface of the basi-occipital, and not to two basilar condyles, the preopercular bone, the simple structure of the lower jaw, the double spines of the neur- and hæm-apophyses, the green color of the ossified parts of the skeleton; these external and osteological characters being associated with an intestinal spiral valve, with the absence of pancreas and spleen,* the position of the anus anterior to the allantoid bladder, a dicœleus heart, six pairs of branchial arches, with the gills concealed, the simple organ of

*Müller or Peters has demonstrated the existence of a spleen in the *Rhinocryptis amphibia* of Peters, which is doubtless a species of Owen's genus *Protopterus*. It is large, and situated behind the stomach and commencement of the intestinal canal, and beneath the peritoneal coat of the tractus intestinalis. It must be separated from the black pigment which forms a copious substratum beneath the peritoneal covering of the intestines.

hearing consisting only of the acoustic labyrinth excavated in cartilage and provided with large otolithes, and, lastly, the blind nasal sacs, form a cumulative body of evidence in proof that the *Lepidosiren* is a fish, which far outweighs the argument to the contrary, founded on the reptile-like development of its air-bladder and its conversion into an organ of aërial respiration."

After this able and elaborate summary, it will be only necessary to notice some of the objections that have been since brought against the reference of the *Lepidosirenoids* to the class of Fishes. The most prominent of those objectors are Bischoff and Milne Edwards. The former, influenced especially by the consideration of the position of the posterior nostrils, believed that they were true Amphibians. He found that the hinder nostrils opened into the cavity of the mouth near to the commissure of the lips. Milne-Edwards himself admits that their abnormal position may be in part accounted for by the absence of superior maxillary bones. Nor is such a termination of the olfactory canal peculiar to the *Lepidosirenoids*. An analogous arrangement occurs in the whole family of Ophisuroids of Kaup, which has, consequently, been placed by that naturalist in a peculiar section, called by him "*Cryptomycteres*." Those apodal fishes "have a posterior nostril, which is placed in a cleft on the border of the lip, or perforates the inner soft part thereof." The slight resemblance or analogy to that family in its elongated form, and the character of the vertical fins, may be also remarked. It is further worthy of note that in the Ophisuroids, as members of the order of Apodes, the supramaxillary, as well as the intermaxillary bones are small. But in the other families of Apodes, the nostrils preserve nearly their usual ichthyic position and relation to each other.

Milne-Edwards again urges as a previously neglected argument in favor of the Amphibian nature of *Lepidosiren*, the opening of the ductus pneumaticus of the pulmonary sacs into the *ventral* face of the digestive canal. But we also find a similar arrangement in the species of the genus *Polypterus*, animals whose piscine characters and affinities have never been called in question.

Milne-Edwards commences with the observation that the lungs of the Mammals, Birds and Reptiles, as every one knows, always originate from the *ventral face* of the digestive tube, whatever their position may be in the splanchnic cavity, and it is only on the ventral side of the pharynx that the opening of the glottis is found. He continues and remarks that "it is the same with the *Lepidosiren*; and if the resemblance between the lungs of all these animals and the air-bladder of the *Lepisosteus* and of the *Amia* was as great as Mr. Owen seems to think it is, we ought to find this same character of organic relationship between the œsophagus and the bladder of these fish. Now, it is quite the contrary; for the kind of pseudo-glottis which establishes the communication between this cellular pouch and the digestive tube, originates from the *dorsal face* of the

œsophagus. There exists, then, a fundamental anatomical difference between these parts, whatever else may be their physiological functions, and this difference furnishes a fresh argument in favor of the opinion of those who consider the *Lepidosiren* as a reptile."

The resemblance of the air-bladder of the *Polypterus* to the pulmonary sacs of *Lepidosiren* has been justly insisted on by Owen. The air-bladder of *Polypterus* is described by him as being double, consisting of two long cylindrical lobes, but of unequal length, the left being the longest, and extending through the whole length of the abdomen. It has also been stated to communicate by an elongated fissure with the *ventral floor* of the throat. The fissure is also said by Geoffroy St. Hilaire to be provided with a constrictor muscle.

There is then no fundamental difference between the pulmonary sacs or air-bladders of the Lepidosirenoids and the Polypteroids. If *Lepidosiren* is to be regarded as an Amphibian on account of the communication of the pulmonary sacs with the inferior face of the intestinal canal, then, for the same reasons, the Polypteroids are to be considered as Amphibians. But the affinities of the Polypteroids with the Lepidosteoids of America are undeniably very great; the latter have the lung-like air-bladder communicating by a long fissure with the *upper region* of the œsophagus, and thus agree with the fishes. The comparatively slight importance of that character alone in determining the classification of *Lepidosiren* is then evident.

It is a fact of no little interest that the *Polypteri*, which have an air-bladder so similar to that of the *Lepidosirenes*, do also, of all known fishes, most resemble them in the form and development of the different elements of the brain.

The attachment of the scapular arch directly to the skull is one of the strongest evidences of the pertinence of the Lepidosirenoids to the class of Fishes. The *Protopterus annectens* is asserted by Owen to have "the scapular arch directly suspended to the skull, but with this peculiarity, that it is connected by a synovial joint with the exoccipitals only." It is the *fact* of suspension of the scapula to the skull that is of value in this case; the *manner* or *means* by which it is suspended is abnormal, and does not occur in other fishes. Professor Owen has then remarked that "in all osseous fishes, and in those Ganoid's, as the Sturgeons, e. g., that come nearest to the *Lepidosiren* in some parts of their structure, the scapula is suspended by two processes to the paroccipital and to the mastoid."

The jointed pectoral and ventral filaments of *Protopterus* still further indicate the affinity of Lepidosirenoids to the fishes. Those of the so called *Rhinocryptis amphibia* have been described by Peters as not merely consisting of single articulated rays, "but also of cartilaginous rays which emanate from the inferior margin of the main limb or principal ray of the fin, and to which still finer cartilaginous filaments are attached.

These rays are not extensions of the main limbs of the fin, but are attached; the length of the rays diminishes towards the end of the main limb or principal ray of the fin until it becomes inappreciable; the extremities of the rays do not lie loosely upon the skin, but the whole fin is covered by a prolongation of the skin, which also covers the principal ray of the fin. In the pectoral fins, the beard of the fin is as long as its ray. In the ventral fins, one-third of the length of the ray is free at the base of the fin; this then commences very low and remains much lower than in the pectoral fins. In the latter, the beard of the fin external to the ray is three lines broad in its widest part. This kind of formation of the fins, in which the rays arise laterally from a main ray, is quite peculiar, and we have no other example of it amongst fish, except in the dorsal fin of *Polypterus*."

The structure of the ventral fins of the singular genus *Bregmaceros* of Thompson, or *Calloptilum* of Richardson, furnishes a much more evident analogy to the pectoral and ventral members of *Protopterus* than does the structure of the dorsal fin of *Polypterus* above cited. The ventral fins of *Bregmaceros mirus* of Richardson, formerly described as *Calloptilum mirum*, is thus made known by its describer.

Each ventral fin is "composed of three long, tapering jointed rays, having oblique joints at their bases and transverse ones near the tips. In a small piece of membrane which lies in the axilla of the long rays, there are sixteen short jointed branches, which are grouped so that they may be the tips of three, or perhaps more rays."

The structure so described appears to be strictly analogous to that of the pectoral and ventral members of the *Protopteri*. The genus *Bregmaceros*, is composed of two species found in the Chinese seas; it belongs to the family of Blennoids, a family which is distinguished partly by the small number of rays in the ventral fins; the number is rarely more than two or three. The "three long, tapering jointed rays" of *Bregmaceros* represent the ventral rays of the normal Blennoids, and the branches which lie in the axillæ of the inner rays are supernumerary, of which no other group, except the Lepidosirenoids, is known to furnish an example.*

The *Protopterus* of Owen and *Rhinocryptis* of Peters have each only a single auricle and ventricle to the heart. This has been positively stated by Owen and Müller or Peters.

In the genus *Lepidosiren*, embracing only elongated species like the type of the genus, the rays have been described as simple, and the heart has been said to have two auricles.

* From an examination of the figure of the male of *Anableps* in the eighteenth volume of the "Histoire Naturelle des Poissons," it might be supposed that the anal fin of that fish furnished another analogous instance. Such is not the case; the artist has erroneously represented its structure. And even if the anal rays were attached to the genital production as represented in the figure, the case could scarcely be regarded as analogous to that of the pectoral and ventral members of *Protopterus*.

The close affinities of the *Protopteri* and *Lepidosirens* cannot be denied. If the observations which have been made on *Lepidosiren* are correct, the result is then only to demonstrate that naturalists have placed too great value on the partition of the heart. It is indeed certain that the presence of two auricles is not even a positive character of the Amphibians. In the genus *Proteus*, the heart is said, by Owen, to possess a single undivided auricle, and he well remarks that "were even the 'septum auricularum' absent in the Salamander or Frog, these would not, therefore, be Fishes.

It would appear, then, that doubt can not much longer be entertained of the pertinence of the *Lepidosirenoids* to the class of Fishes, or at least to a class different from the Amphibians, if, with Professor Agassiz, we should admit that four classes are confounded among the Fishes. The more our knowledge of the anatomy of the *Ganoids* and the characteristics of Fishes is increased, the stronger becomes the evidence of the relations of the *Lepidosirenoids* to Fishes. The analysis of Owen, and the preceding remarks, will fully confirm the truth of this assertion.

If the question of pertinence of those animals to the class of Fishes is decided in the affirmative, there still remain to be discussed their position in that class, and the station and rank to which they are entitled.

Müller has formed a distinct subclass which he has called *Dipnoi*, and which is principally characterized by the presence of true scales on the body, the possession of both lungs and gills, and the internal structure of the *bulbus arteriosus*. Can this subclass be retained?

The similarity of the air bladder of the *Polypteri* to the pulmonary sacs of the *Lepidosirenoids* has been already commented on. There seems to be no essential difference between the two, either anatomically or physiologically. The branchial arches with their branchiæ are alike present in each, and although those of *Lepidosiren* are somewhat modified, they also are essentially the same as in the *Polypteri* and the rest of the *Ganoids*. The presence of cycloid scales is not decisive, for such are found to be possessed by species of the genus *Amia*, and by other *Cycloganoids*.

There is one difference, however, between the true *Ganoids* of Müller and his *Dipnoi* which is of considerable importance. The *Ganoids* have been characterized by Müller as fishes provided with numerous valves in the arterial trunk. In this respect they differ from the *Dipnoi*. Professor Owen has given the following description of the arterial trunk or *bulbus arteriosus* of the *Lepidosiren annectens*, or rather *Protopterus annectens*:

"This body presents externally a simple transversely oval form, but its internal structure is more complicated than would be suspected from its external appearance. It is formed by a short spiral turn of the dilated aorta, which is concealed under a simple continuous outer fibrous coat; the area of this part of the vessel is almost entirely occupied by two continuous valvular projections, or their processes, which are attached by one edge to the internal surface of the aorta, and have the opposite margin pro-

jecting freely into the arterial cavity. If these internal valves were straight, they would resemble the single thicker valvular process which occupies the elongated bulbus arteriosus of the *Siren*; here, however, they follow the spiral turn of the aorta."

This structure of the arterial trunk has perhaps more analogy to that of the Amphibians than to that of fishes; but the two longitudinal valvular projections or ridges of the arterial trunk of *Protopterus* appear, nevertheless, not to be fundamentally different from the longitudinal rows of valves found in the trunk of the Ganoids, especially of the Amioids. By the coalescence of the valves of each of the respective rows in the bulbus arteriosus of the *Amia*, analogous ridges would be formed.

Another distinction from all other fishes is produced by the abnormal suspension of the scapular arch only to the exoccipital bones of the Lepidosirenoids.

The importance of both of the above mentioned peculiarities is undoubtedly of considerable value, but it is very doubtful whether they alone are of sufficient importance to authorize the separation of the Lepidosirenoids from the subclass of Ganoids.

The Lepidosirenoids have many affinities with the Ganoids. The brain bears a considerable resemblance to that of the Polypteroids and the Acipenseroids; the persistent notochord, combined with ossified vertebral elements, recalls to mind the similar structure which prevailed in many of the older representatives of the subclass; the strict homology of the pulmonary sacs and communication with the intestinal canal of *Lepidosiren* and *Polypterus*; the presence of a spiral valve in the intestines; the abdominal position of the ventral members, are all characters which indicate the close alliance of the Dipnoi and Ganoids. Cycloid and regularly imbricated scales are found on the recent Amioids of America, and in extinct representatives of the order. We appear then justified in considering the internal structure of the arterial trunk, and the mode of attachment of the scapula to the cranium, as of secondary value. As the Dipnoi agree in all other essential respects with the Ganoids, we will then at least provisionally consider them as belonging to the same great subclass for which the latter name may be retained.*

Professor Owen has for the most part adopted the classification proposed by Müller, but has not recognized the subclasses, of which six were named

* It was not until some time after the completion of the above remarks that the observation of Müller respecting the reference by Agassiz of the genus *Lepidosiren* to his order of Ganoids was noticed. The reasons assigned by Agassiz for that act have not been stated. We do not know where that naturalist has published his observations. In his recent *Essay on Classification*, the Ganoids are simply accepted as a class with three undoubted orders called *Cœlacanth*s, *Acipenseroids* and *Sauroids*; and three doubtful ones, the *Siluroids*, *Plectognaths* and *Lophobranch*es. It can scarcely be intended to refer the Lepidosirenoids to any of those orders. We remain, therefore, in doubt as to the position that Professor Agassiz would assign to them.

by that zoologist, and has united the Marsipobranchii and Pharyngobranchii, which were believed by Müller to form distinct subclasses, into one order. The Lepidosirenoids are regarded as forming the ninth order in an ascending rank; on that order, the name of Protopteri has been bestowed.

Do the Ganoids form an integral part of the class of Fishes? Are the distinctions between the Müllerian Ganoids and Teleosteans then of no more than ordinal value?

Naturalists will admit that the differences between the natural groups that have been named Teleostei, Elasmobranchii, and Dermopteri, are of much greater value than those which have been employed to separate the Teleostei into the groups that have been called orders. It may be objected to this view that orders are not necessarily of equal value. Such may be admitted to be the case: orders may be of quite unequal value. But there are between the groups above named, important fundamental differences which can scarcely be considered as of only ordinal value. The distinctions between them, as well as the Ganoids, have been even regarded by Agassiz as indicating classical value. While naturalists will not probably, at least immediately, accept this doctrine, it must still be admitted that three of those groups, if not all, are of much more than ordinal importance. For the present, then, they may be regarded as subclasses.

But it will be doubtless questionable with some whether the Ganoids are entitled to an equal rank with the Elasmobranchii and the Dermopteri; whether they do not themselves belong to one subclass composed of them and the Teleostei, or typical fishes.

Although the Ganoids do not externally present the same trenchant characters as the Elasmobranchii and Dermopteri; although there is considerable resemblance between representative genera of the Teleostean and Ganoid groups: and though the limits of those groups have been and may perhaps be still considered doubtful,—there are important and permanent anatomical distinctions between them, and those anatomical characters have been regarded as possessing real value. While, therefore, we may admit that there is not as great differences between the Teleostei and the Ganoids, as between the other subclasses, we may still, believing that groups need not be of exactly equal value, regard those two as representing distinct subclasses. At the same time, it is admitted that future researches and more profound investigations may demonstrate the unity of those subclasses.

Those researches may also confirm the idea of the absence of homogeneity in the class of Fishes, and prove that three classes are compounded under that name which are equivalent to the subclasses, as here adopted, of the Dermopteri, the Elasmobranchii, and the united Teleostei and Ganoids. The two latter may then be found to form the subclasses of that class.*

*There is still room for doubt as to the value of the distinctions between the various groups of the cold blooded vertebrated animals. Professor Owen has pro-

The subclasses of Ganoids as now characterized may be provisionally divided into four orders, for which may be accepted the names of Holostei, Placoganoidei, Chondrostei and Dipnoi.

Order *HOLOSTEI* Müller.

The order of Holosteans embraces those fishes provided with plates which are either rhomboid and tiled or oval and imbricated. The hyoid apparatus has one or many branchiostegal rays. The centre of the vertebræ are either ossified or represented by a persistent notochord; the neurapophyses and hæmapophyses are always ossified. The dorsal and anal fins are sustained by true dermo-neural spines articulated with the inter-neural spines. The scapular arch is suspended by two processes to the paroccipital and the mastoid bones, and sustains well developed pectoral fins provided with many rays. The abdominal ventral fins are also supported by several rays. The bulb of the aorta has several longitudinal rows of valves.

The order of Holosteans, as thus limited, embraces among recent fishes only the families of Lepidosteoids, Polypteroids and Amioids, but the number of its extinct representatives is very large. The order itself may be subdivided into two suborders, to which may be given the names of Rhomboganooids and Cycloganooids,—there appearing to be a certain correlation between the form and structure of the plates or scales and the rest of the organization. The first two of the three orders above enumerated are Rhomboganooids; the family of Amioids belongs to the suborder of Cycloganooids.

Order *PLACOGANOIDEI* (Owen.)

This group, which is now elevated to the rank of an order of the subclass of Ganoids, was first accepted by Professor Owen, as a suborder of the order of Ganoidei; the name conferred on it by Owen has been retained as the ordinal designation. Its representatives are confined to the earlier ages of the world's history. Their internal skeleton was either entirely cartilaginous or the notochord was persistent. The head and anterior part of the body were encased in a dense and compact helmet and coat of mail. The posterior part of the body was covered with comparatively small plates of various forms.

posed that they should be considered as forming a single class, of which the Reptiles and Amphibians of most modern zoologists may belong to one subclass and the Fishes to another. Other naturalists consider the Amphibians as more nearly related to the Fishes, and together separated from the true Reptiles by the absence of the allantois which more or less envelops the embryo of the latter. It might be equally appropriate to unite with Professor Owen all the cold blooded Vertebrata in one class, for which the Owenian name of *Hæmatocrya* may be retained, or to separate them into five or perhaps six classes, those of the Reptiles, the Amphibians, the Fishes, the Elasmobranchiates, the Dermop-teri, and possibly the Ganoids.

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Order *CHONDROSTEI*, Müller.

The body is sometimes naked, but in most of its species is covered with more or less interrupted rows of osseous or ganoid plates of irregular form. There are also many smaller plates or tubercles scattered on different parts of the body. There are no true branchiostegal rays.*

The vertebræ and their elements are cartilaginous. The skull is also generally cartilaginous, but is sometimes imperfectly ossified anteriorly. The scapular arch is suspended by two processes to the paroccipital and to the mastoid bones; it supports two well developed pectoral fins. The ventral fins are also furnished with several rays. The bulb of the aorta is furnished with several longitudinal rows of valves.

This order embraces two families of recent fishes; the Sturionoids of the northern portions of the old and new worlds, and the Polyodontoids peculiar to the rivers of the central parts of North America.

Order *DIPNOI* Müller.

The body is elongated, and covered with regularly imbricated cycloid scales. The centra of the true vertebræ are cartilaginous, the notochord being persistent. The neurapophyses and hæmapophyses with their respective spines are osseous. The continuous vertical fin or fold, encircling the posterior part of the body, is sustained by *articulated rays*, immediately connected with the spinous processes of the neurapophyses and hæmapophyses. The scapular arch is suspended only to the exoccipital bone, and supports on each side a simple unjointed or articulated ray. The ventral fins are also represented by a simple ray on each side. The bulb of the aorta is furnished internally with two spiral ridges or valves.

Of this order, only a single family, embracing two genera, is known. The genus *Lepidosiren*, of Natterer, is confined to South America, and the *Protopteri*, of Owen, to Africa.

Subclass ELASMOBRANCHII Bon.

The ELASMOBRANCHII of Bonaparte and Müller have the endo-skeleton or vertebral column and skull cartilaginous, or very imperfectly ossified. The exo-skeleton is developed in the form of placoid granules. The brain is much more complex and highly developed than in the true fishes: the optic nerves are connected by a commissure, but do not cross each other. The *bulbus arteriosus* or *aorta* has a thick muscular coat, and is provided with at least two rows of semilunar valves. The intestine has a spiral valve. The males are provided with the so-called "claspers," which are present as appendages to the posterior edges of the ventral fins; fecundation is effected by copulation. The branchial apertures are usually five in number, and are generally all external. There is no air bladder.

*This character must be accepted with some modification; the ceratohyal of the representatives of the genus *Polyodon* has on each side an appendage which is evidently homologous to the branchiostegal rays of other fishes.

There are two orders in this sub-class, the *Plagiostomi* and the *Holocephali*, which may be briefly distinguished as follows:

Order *PLAGIOSTOMI* Dumeril.

There are almost always five external branchial apertures, the only exceptions occurring in the family of Notidanoids. In *Hexanchus* of Rafinesque, there are six, and in the *Heptanchias* of the same author, there are seven.

The Plagiostoms may be again divided into four suborders, the *Squali*, the *Rhinæ*, the *Pristes* and the *Raiæ*.

Suborder SQUALI Müller and Henle.

The Squali are distinguished by the lateral position of the branchial apertures, free supplementary eyelids, an incomplete scapular arch, and the absence of a naso-pectoral cartilage. The form is always more or less elongated and subcylindrical.

In the suborder, as now restricted, only the sharks are included. The *Rhinæ* or *Squatinæ*, embraced in the group by Müller and Henle, may be considered as representing another suborder.

Suborder RHINÆ Gill.

This suborder is principally distinguished from the Squali by the depressed head and body, and the dorsal position of the eyes. As in the Squali, the branchial apertures are situated on the sides, but are placed in a furrow, which separates the large and anteriorly expanded pectoral fins from the body. The mouth is at the extremity of the snout.

This group contains only one genus represented by three species.

Suborder PRISTES Gill.

The Pristes have the elongated and subcylindrical bodies of the Squali, but the branchial apertures are open, as in the Rays, on the ventral surface of the breast. The snout is prolonged into a long, narrow and depressed dagger-like beak, which are provided with strong osseous spines or teeth on each side. The teeth of the jaws are flat and paved.

This suborder embraces living representatives of only one genus, which must be referred to a peculiar family, that of the *Pristoids*. It is represented by a single species on the American coast.

Suborder RAIÆ Müller and Henle.

The RAIÆ have the branchial apertures beneath the body under the pectoral fins and before the ventrals. The eyes and spout-holes are always on the dorsal aspect of the head; the scapular arch complete, and naso-pectoral cartilages present. There is no eyelid, or only an adnate upper one.

In this suborder, the Rays and allied fishes, with similar depressed bodies, are alone embraced.

Order *HOLOCEPHALI* Bon.

In the species of this order, there is only one branchial fissure on each side as in true fishes.

No representatives of the *Holocephali* have yet been detected on the Eastern American Coast.

Subclass *DERMOPTERI* Owen.

The fourth subclass may provisionally embrace both the *Cyclostomi* or *Marsipobranchii* and the *Pharyngobranchii* or *Cirrhostomi*. Thus enlarged, it corresponds to the *DERMOPTERI* of Owen, and may retain that name. The body is much elongated and either subcylindrical or compressed. The endoskeleton is very rudimentary and cartilaginous, and in the order of *Pharyngobranchii*, there is no distinct head. The pectoral and ventral fins are both absent. The skin is entirely naked and mucous, and the fins are only folds of the skin. There are no pancreas nor air-bladder. The olfactory organ and nostril are single.

There are two orders.

Order *HYPEROARTII*, (Bon.) Müll.

The body is invariably greatly elongated and subcylindrical, or anguilliform. The head is distinct. The myelon, or medulla spinalis, is described by Owen as being depressed and flattened, "of opaline subtransparency, ductile and elastic." The *bulbus arteriosus* is absent, but there are two opposite valves at the origin of the branchial vessel, as in the *Teleostei*. The branchiæ are purse-shaped and inoperculate; there are seven in number on each side. Each receives the streams of water for the aëration of the blood through short tubes, entering from a median canal which is below and distinct from the œsophagus, and which terminates behind in a closed wall, and, according to Professor Owen, communicates with the fauces anteriorly "by an opening guarded by a double membranous valve."

This order answers to the order of the same name of Müller, and the family of *Petromyzontoids* of the order *Dermopteri* of Owen. It embraces, on our coast, the "lampreys," or "lamper-eels" (*Petromyzon*).

Order *HYPEROTRETI*, (Bon.) Müller.

The representatives of this order resemble, in most respects, those of the *Hyperoartii*, chiefly differing in the respiratory apparatus. The branchiæ are bursiform and fixed, receiving the streams of water directly from the œsophagus through short tubes communicating with each sac. The water is discharged through tubes which either severally open externally, or into two lateral and longitudinal canals, directed backwards and discharging by as many orifices on each side of the median line of the ventral surface.

Order *PHARYNGOBRANCHII*, Müll.

The body is elongated and compressed, and there is no distinct head ; the heart is also absent. The branchiæ are free, pharyngeal and inoperculate.

This group, embracing a single genus, the *Branchiostoma* of Costa, or *Amphioxus* of Yarrell, has been made by Müller the representative of a distinct subclass. Until its embryology is known, we may retain it among the Dermopteri.

A species of this genus was discovered by Dr. Stimpson and the author at Beaufort, North Carolina, in the spring of the present year.

For our knowledge of the anatomical characters of the preceding groups, we have been chiefly indebted to the labors of the learned Müller, and the great English anatomist, Owen.* The classification here adopted resembles theirs more than any others. The classification of Professor Owen differs from that of Müller in not recognizing the existence of subclasses, and in the less relative value assigned to the Pharyngobranchii and Marsipobranchii. The present arrangement is, therefore, quite different from his, as we cannot consider the differences existing between the Physostomi, Pharyngognathi, Anacanthini and Acanthopteri as even approximating in value to those between the orders just named, and the Ganoids or Elasmobranchiates.

The relative standing and importance of the different subclasses of Fishes above recognized have been variously interpreted by naturalists. Some have placed the Elasmobranchii and Dermopteri near to each other, and by Professor Agassiz they were formerly united in one order, for which the name of Placoids was proposed. In the last classification of Professor Agassiz, the Elasmobranchial order called Selachians and the Marsipobranchial Dermopteri called Myzontes are regarded as belonging to different classes, between which the Ganoids and Fishes, which are also considered as classes, are interposed. Other naturalists have regarded those two subclasses as representing the opposite extremes of the class, and have placed the Elasmobranchii in the first rank and the Dermopteri lowest. Those different allocations have resulted from different points of view from which the groups have been examined. Those naturalists who have approximated the Elasmobranchii and Dermopteri were principally influenced by the cartilaginous condition of the skeleton ; those who placed the Elasmobranchii in the highest rank looked to the special

* We have been especially under obligation to the invaluable " Lectures on the Comparative Anatomy and Physiology of the Vertebrate Animals, delivered at the Royal College of Surgeons of England in 1844 and 1846." The first part, devoted to the Fishes, is rich in information on the structure of those animals. It is the only one that has yet been published.

development of some of the systems, especially the nervous and generative. We will follow Cuvier, and the majority of ichthyologists, in placing next to each other the Dermopteri and Elasmobranchii, and then, in ascending order, will succeed the Ganoids and finally the Teleostei. The considerations which have led us to these results will be briefly stated.

Fishes appear to be constructed according to four different sub-plans, which are characterized by their correspondence to different stages or grades of development of a typical osseous fish. The types so distinguished are equivalent to the four subclasses here admitted. All the subclasses are constructed on the ichthyic modification of the vertebrated plan, but the archetype of each subclass corresponds, in a general manner, to different periods of development of that plan which have successively taken place.

A plan will admit of great modification or adaptation. Species constructed according to an inferior plan do not necessarily exhibit complexity of organization of less degree than those constructed on a higher *plan*. Species framed on inferior plans are capable of a high degree of organization consistent with the plan. The degree of development of the plan or type is the criterion of the station of a group; not the complexity of organization, or adaptation to peculiar habits or modes of life. Applying these principles to the relative classification of the different subclasses of Fishes, we have the following results.

The Dermopteri are the lowest in the scale; they represent an early stage of development of the archetype fish. The subclass exhibits no examples of complexity of organization, or specialization and development of any system or set of organs.

The type of structure of the Elasmobranchii is more perfected, and represents the development of the archetype fish arrested at a more advanced period. It still exhibits many embryonic characteristics, but on account of the complexity and high degree of development and adaptation of special systems or sets of organs, exhibits a high upward tendency.

The subclass of the Ganoids represents a still more advanced period of development, which is more remote from the germ of the embryo than that of either of the preceding. Representatives of this subclass also exhibit a high degree of special development of different systems, but this is of subordinate value to the plan or type of structure.

Finally, the sub-plan of the Teleostei represents the perfected idea of the ichthyic development of the vertebrated plan. For the sake of illustration, it may be said to exhibit the highest advance consistent with the preservation of the ichthyic type.

The conception of the sub-plans and the range of variation exhibited in each, may be represented by four vertical lines.

The Dermopteri are to be represented by a short line.

The Elasmobranchii may be represented by a much elongated line, commencing at a higher level than the line for the Dermopteri.

The Ganoidei also exhibit a high upward tendency, and an approxima-

tion towards the reptiles; the line by which their standing would be represented, commences at a higher level than the preceding, and although elongated, would be less long than that of the Elasmobranchii.

The Teleostei or true fishes would be represented by a line commencing higher up than any of the preceding, but the line itself would be less prolonged than those representative of the Elasmobranchii and Ganoidei, the range of variation being much less. There is no excessive development of any system or organ. The Teleosteans are typical fishes and evince no tendency to approach to the reptiles.

The principles above enunciated may be better understood by their application to other departments of the animal kingdom, or to the vegetable kingdom. The sequence in a descending order of the branches of the former kingdom, now almost universally adopted, is first, the Vertebrata; secondly, the Articulata; thirdly, the Mollusca; fourthly, the Radiata, and finally the Protozoa. It will be denied by no naturalist at the present day, that no regular and continuous chain or series is formed by those animals from the Protozoa to the Vertebrata. For although the Vertebrata, as a group, rank higher than the Articulata, and they above the Mollusca, and the Mollusca are superior to the Radiata, there are still representatives of each of those branches that evince a higher degree of intelligence and greater complexity of organization than some of the representatives of the branches which precede them. The Branchiostoma or Pharyngobranchii, for example, would be considered inferior to many of the higher Articulata, and to the higher Mollusca, especially those of the class of Cephalopods.

The lower orders of worms, and the representatives of the inferior classes of the branch of Articulates, are much inferior in complexity of organization to the higher Mollusks. The Bryozoa of the Molluscan branch would also by almost all naturalists be considered as of an inferior grade to the Echinoderms of the branch of Radiates. Many classes and orders of the animal kingdom will furnish similar illustrations; it is unnecessary to more than allude to them here, as instances will at once occur to the practised naturalist. It will suffice to point to the lower insects in comparison with the higher Crustaceans, and to the lower representatives of the latter class and the higher worms.

The divisions of plants which appear to correspond to the branches of the animal kingdom are the Phanerogams, the Acrogens and the Thallophytes. In the former branch, the sequence of the classes adopted by the botanists is that of Exogens, Gymnosperms and Endogens. But there are many Exogenous plants which afford examples of lower organization than Gymnosperms, or than many of the Endogens, or even than many of the Filicales* among the branch of Acrogens.

* Are not the Ferns and their allies entitled to as high rank in their branch of Acrogens as are the Echinoderms, Acalephs and Polyps in their branch of radiated animals? And do not the Acrogens as a branch include both the true Acrogens and the Anophytes?

These examples appear to be sufficient to demonstrate that it is the plan and not the speciality of structure or organization that indicates the rank of groups.

The number of species described in the Catalogue, nominally amounts to three hundred and ninety-four. It is probable that when the species are thoroughly investigated, the number will be considerably reduced, and that many now retained with hesitation as distinct, will be identified with previously known ones. Those species that are most doubtful have been indicated by an asterisk (*) after the specific name. One or two, of which the genus is doubtful, has been pointed out by the same character placed after the generic part of the name of the species; when one has been introduced on doubtful authority as an inhabitant of the coast, the same is placed before the specific name. The describers of most of the doubtful "new species" were acquainted by description with those to which they are most nearly allied, and had, consequently, better sources of information than ourselves. We have, therefore, not deemed it in most instances proper to attempt a positive identification, when there was a reasonable doubt,—the object of this Catalogue being to present a complete view of the species that have been described. In some cases, descriptions of species have been very meagre, and no distinctions are mentioned by which they can be distinguished from others. In other instances, the descriptions have been very full and complete; but the species have been indicated with a doubt, either on account of the poverty of a former description of an allied species, or from inability to refer at present to the work in which the description occurs.

The Catalogue is only intended to embrace those species found on some portion of the eastern American coast, from Greenland or the Arctic regions to the State of Georgia. South of that, the West Indian Fauna commences, and quite a different association of forms and species occurs. At a future time, a catalogue of the West Indian fishes will be probably published.

In the preparation of the Catalogue, and the acceptance of both generic and specific names, we have been always guided by the law of priority, except when a palpable error would be perpetuated. It may not be apparent, from the list, by whom the species was originally described or named. In most cases, it will be discovered on reference to the works of Doctors Storer, Dekay, or Holbrook. In others, it has been found that species have been named by naturalists which have been unknown or not identified by those naturalists. Such instances we hope soon to be able to publish our observations on.

Many new genera have been introduced here for the first time. We have been compelled to this step in order not to mislead the student in regard to their generic affinities. Several well-known names have also been replaced by new ones, as the former had been already preoccupied

in other branches of natural history. In the latter case, we have always carefully investigated into the history of the first name or names, and only changed that of a genus when it has been ascertained that the former has been legitimately conferred on an older established group, and is entitled to priority. The characters of new genera, and the reason for changing the names of old ones, will be published in due time.

As we could not conveniently, except in very few cases, refer to more than one author in the synonymy, we have used the work of Dr. Storer on the Fishes of North America. In that compilation will be found references to other authors. The synonymy of a large proportion of our marine fishes has been collated; but it is not yet convenient to publish the results. When a species has not been noticed by Dr. Storer, reference has been made to the first author by whom it was indicated as a native of our waters.

The true popular names, when known, have been added after the specific name. We have not deemed it proper to invent "scientific popular" ones, as we see no advantage that can be gained by their introduction. They will never be used by the people at large, nor will they be recognized by naturalists. There is but one true name for a species, and by that name alone is it known to the scientific men of all countries. It is proper to warn the unscientific reader, that because he recognizes a name applied to a species, it is by no means certain that such a name indicates the same species in his own section of the country. There is no constancy nor rule in the application of vernacular names. The same designation may apply to fifty different species, and the same species may receive, in different parts of the country, fifty different names. It is, therefore, with much doubt that any species is to be identified from a similarity of the popular names alone. The names inserted are generally those by which the species are known at New York. Those by which some are designated at Charleston are also included.

The author, trusting that the present list may prove of some benefit to the student, and induce investigation among a class that has hitherto not received a due share of attention from the American naturalist, respectfully submits it to the public.

Smithsonian Institution, Washington, D. C.

Subclass TELEOSTEI Muller.

Order TELEOCEPHALI Gill.

Suborder PHYSOCLYSTI (Bon.)

Family PERCOIDÆ Cuv.

Subfamily PERCINÆ Gill.

Genus ROCCUS (Mitch.) Gill.

ROCCUS LINEATUS *Gill*. "Rock Fish," "Striped Bass."Labrax lineatus *Storer*. Synopsis Fishes N. A., p. 21.

Genus MORONE (Mitch.) Gill.

MORONE AMERICANA *Gill*. "White Perch."Labrax rufus (*Dekay*) *Storer*. Synopsis Fishes N. A., p. 22.Labrax pallidus (*Dekay*) *Storer*. Loc. cit., p. 22.Labrax nigricans (*Dekay*) *Storer*. Loc. cit., p. 23.

Subfamily SERRANINÆ (Sev.)

Genus CENTROPRISTIS Cuv.

CENTROPRISTIS ATRARIUS *Barneville*. "Sea Bass."Centropristes atrarius *Holbrook*. Ichthyology of South Carolina, p. 42, pl. vii., fig. 2.CENTROPRISTIS NIGRESCENS *Gill*. "Sea Bass."Centropristes nigricans *Storer*. Synopsis Fishes N. A., p. 35.

Genus TRILOBURUS Gill.

TRILOBURUS TRIFURCUS *Gill*.Centropristes trifurca *Storer*. Synopsis Fishes N. A., p. 35.

Genus DIPLECTRUM Holbrook.

DIPLECTRUM FASCICULARE *Holbrook*.Serranus fascicularis *Storer*. Synopsis Fishes N. A., p. 28.

Genus EPINEPHELUS (Bloch.)

EPINEPHELUS MORIO *Gill*.Serranus morio *Storer*. Synopsis Fishes N. A., p. 25.EPINEPHELUS ERYTHROGASTER *Gill*.Serranus erythrogaster *Storer*. Synopsis Fishes N. A., p. 30.EPINEPHELUS NIGRITUS *Gill*.Serranus nigrinus *Holbrook*. Ichthyology of South Carolina, p. 173, pl. 25, fig. 2.EPINEPHELUS OXYPTERUS *Gill*.Corvina oxyptera (*Dekay*) *Storer*. Synopsis Fishes N. A., p. 72.EPINEPHELUS ACUTIROSTRIS *Gill*.Serranus acutirostris *Storer*. Synopsis Fishes N. A., p. 29.

Subfamily DULINÆ Gill.

Genus DULES Cuv.

DULES AURIGA *Cuv. and Val.* "Coachman."Dules auriga *Storer.* Synopsis Fishes N. A., p. 44.

Subfamily RYPTICINÆ Gill.

Genus PROMICROPTERUS Gill.

PROMICROPTERUS MACULATUS *Gill.* "Soap Fish."Rypticus maculatus *Holbrook.* Ichthyology of South Carolina.
p. 39, pl. 6, fig. 2.

Family SPAROIDÆ Cuv.

Subfamily SPARINÆ Bon.

Genus SPARUS (Linn.) Bon.

SPARUS ACULEATUS *Gill.*Chrysophrys aculeata *Storer.* Synopsis Fishes N. A., p. 82.

Genus PAGRUS Cuv.

PAGRUS ARGYROPS *Cuv.* "Porgie."Pagrus argyrops *Storer.* Synopsis Fishes N. A., p. 82.

Genus SARGUS (Klein.)

SARGUS OVICEPHALUS *Gill.* "Sheep's-head."Sargus ovis *Storer.* Synopsis Fishes N. A., p. 80.SARGUS ARENOSUS *DeKay.*Sargus arenosus *Storer.* Synopsis Fishes N. A., p. 81.

Genus LAGODON Holbrook.

LAGODON RHOMBOIDES *Holbrook.*Sargus rhomboides *Storer.* Synopsis Fishes N. A., p. 81.

Family PIMELEPTEROIDÆ Gill.

Subfamily PIMELEPTERINÆ Bon.

Genus PIMELEPTERUS Lac.

PIMELEPTERUS BOSCH *Lac.*Pimelepterus Boschii *Storer.* Synopsis Fishes N. A., p. 89.

Family MÆNROIDÆ Cuv.

Subfamily MÆNINÆ Bon.

Genus EUCINOSTOMUS Baird and Girard.

EUCINOSTOMUS ARGENTEUS *Baird and Girard.*Eucinostomus argenteus *Baird and Girard.* Ninth Annual Report
Smith. Inst., p. 345.

Genus GERRES Cuv.

GERRES APRION* *Cuv. and Val.*Gerres aprion *Storer.* Synopsis Fishes N. A., p. 84.

Family ZENOIDÆ (Lowe.)

Subfamily ZENINÆ Gill.

Genus ZEUS Linn.

ZEUS OCELLATUS *Storer.*Zeus ocellatus *Storer.* Proc. Boston Soc. Nat. Hist.

Family PRISTIPOMATOIDÆ Gill.

Subfamily PRISTIPOMATINÆ Gill.

Genus ANISOTREMUS Gill.

ANISOTREMUS VIRGINICUS *Gill.*Pristipoma rodo *Storer.* Synopsis Fishes N. A., p. 76.

Genus ORTHOPRISTIS Girard.

ORTHOPRISTIS FULVO-MACULATUS *Gill.*Hamulon fulvo-maculatum *Storer.* Synopsis Fishes N. A., p. 76.

Genus HÆMULON Cuv.

HÆMULON ARCUATUM *Cuv. and Val.* "Grunts."Hæmulon arcuatum *Storer.* Synopsis Fishes N. A., p. 76.HÆMULON FORMOSUM *Cuv.*Hæmulon formosum *Storer.* Synopsis Fishes N. A., p. 73.HÆMULON CHRYSOPTERON *Cuv.*Hæmulon chrysopteron *Storer.* Synopsis Fishes N. A., p. 74.

Subfamily LOBOTINÆ Gill.

Genus NEOMÆNIS Girard.

NEOMÆNIS EMARGINATUS *Girard.*Lobotes emarginatus *Baird and Girard.* Ninth Annual Report
Smith. Inst., p. 332.

Genus LOBOTES Cuv.

LOBOTES SURINAMENSIS *Cuv.*Lobotes surinamensis *Storer.* Synopsis Fishes N. A., p. 78.

Family SCLÆNOIDÆ (Cuv.)

Subfamily SCLÆNINÆ (Bon.)

Genus OTOLITHUS Cuv.

OTOLITHUS REGALIS *Cuv.* "Weak Fish."Otolithus regalis *Storer.* Synopsis Fishes N. A., p. 66.OTOLITHUS CAROLINENSIS *Cuv. and Val.*Otolithus caroliniensis *Storer.* Synopsis Fishes N. A., p. 66.OTOLITHUS THALASSINUS *Holbrook.*Otolithus thalassinus *Holbrook.* Ichthyology of South Carolina,
p. 132, pl. xviii., fig. 2.OTOLITHUS NOTHUS *Holbrook.*Otolithus nothus *Holbrook.* Ichthyology of South Carolina, p. 134,
pl. xix., fig. 1.

Genus *JOHNIUS* Bloch.

- JOHNIUS OCELLATUS* *Girard*. "Red Fish."
Corvina ocellata *Storer*. Synopsis Fishes N. A., p. 67.

Genus *BAIRDIELLA* Gill.

- BAIRDIELLA ARGYROLEUCA* *Gill*. "White Perch."
Corvina argyroleuca *Storer*. Synopsis Fishes N. A., p. 105.

Genus *HOMOPRION* Holbrook.

- HOMOPRION SUBTRUNCATUS* *Gill*.
Leiostomus xanthurus *Storer*. Synopsis Fishes N. A., p. 69.
HOMOPRION LANCEOLATUS *Holbrook*.
Homoprion lanceolatus *Holbrook*. Ichthyology of South Carolina,
 p. 168, pl. xxiii., fig. 1.

Genus *LIOSTOMUS* Lacepede.

- LIOSTOMUS XANTHURUS* *Lacepede*. "Lafayette."
Leiostomus obliquus *Storer*. Synopsis Fishes N. A., p. 69.

Genus *UMBRINA* Cuv.

- UMBRINA ALBURNUS* *Holbrook*. "King Fish."
Umbrina alburnus *Holbrook*. Ichthyology of South Carolina,
 Georgia and Florida, p. 3, pl. i., fig. 1.
UMBRINA NEBULOSA *Cuv*.
Umbrina alburnus *Storer*. Synopsis Fishes N. A., p. 71.
UMBRINA LITTORALIS *Holbrook*.
Umbrina littoralis *Holbrook*. Ichthyology of South Carolina,
 Georgia and Florida, p. 10, pl. i., fig. 2.

Genus *MICROPOGON* Cuv.

- MICROPOGON COSTATUS* *Cuv*.
Micropogon costatus *Storer*. Synopsis Fishes N. A., p. 73.
MICROPOGON UNDULATUS *Cuv, and Val*.
Micropogon undulatus *Storer*. Synopsis Fishes N. A., p. 73.

Genus *POGONIAS* Lac.

- POGONIAS CHROMIS* *Lac*. "Drum."
Pogonias chromis *Storer*. Synopsis Fishes N. A., p. 72.
POGONIAS FASCIATUS *Cuv, and Val*.
Pogonias fasciatus *Storer*. Synopsis Fishes N. A., p. 72.

Subfamily *LARIMINÆ* Gill.Genus *LARIMUS* Cuv.

- LARIMUS FASCIATUS* *Holbrook*.
Larimus fasciatus *Holbrook*. Ichthyology of South Carolina,
 p. 153, pl. xxii., fig. 1.

Family CHÆTODONTOIDÆ Bon.

Subfamily CHÆTODONTINÆ (Bon.) Gill.

Genus HOLACANTHUS Lac.

HOLACANTHUS CILIARIS *Lac.* "Angel Fish."Holacanthus ciliaris *Storer.* Synopsis Fishes N. A., p. 87.

Subfamily EPHIPPIINÆ Gill.

Genus EPHIPPUS Cuv.

EPHIPPUS FABER *Cuv.*Ephippus faber *Storer.* Synopsis Fishes N. A., p. 87.EPHIPPUS GIGAS *Cuv.*Ephippus gigas *Storer.* Synopsis Fishes N. A., p. 87.

Family TEUTHIDOIDÆ (Bon.)

Subfamily TEUTHIINÆ (Bon.)

Genus ACANTHURUS (Forsk.)

ACANTHURUS PHLEBOTOMUS *Bloch.* "Surgeon."Acanthurus phlebotomus *Storer.* Synopsis Fishes N. A., p. 111.ACANTHURUS CERULEUS *Bloch.*Acanthurus ceruleus *Storer.* Synopsis Fishes N. A., p. 112.

Family CAMPYLODONTOIDÆ Gill.

Subfamily CAMPYLODONTINÆ Gill.

Genus CAMPYLODON Fabricius.

CAMPYLODON FABRICII *Reinhardt.*Notacanthus nasus *Storer.* Synopsis Fishes N. A., p. 100.

Family BRAMOIDÆ Lowe.

Subfamily CENTROLOPHINÆ Gill.

Genus PALINURICHTHYS Gill.

PALINURICHTHYS PERCIFORMIS *Gill.*Palinurus perciformis *Storer.* Synopsis Fishes N. A., p. 99.

Subfamily PTERACLINÆ Swainson.

Genus PTERACLIS Gronovius.

PTERACLIS CAROLINUS *Val.*Pteraclis carolinus *Storer.* Synopsis Fishes N. A., p. 109.

Family CORYPHÆNOIDÆ (Lowe.)

Subfamily CORYPHÆNINÆ Bon.

Genus CORYPHÆNA Linn.

CORYPHÆNA LESUERII *Val.* "Dolphin."Coryphæna Lesuerii *Storer.* Synopsis Fishes N. A., p. 107.CORYPHÆNA GLOBICEPS *Dekay.**Coryphæna globiceps *Storer.* Synopsis Fishes N. A., p. 107.

Genus CARANXOMORUS* Lac.

CARANXOMORUS PUNCTULATUS* Gill.

Lampugus punctulatus Storer. Synopsis Fishes N. A., p. 108.

Subfamily PEPRILINÆ Gill.

Genus PEPRILUS Cuv.

PEPRILUS LONGIPINNIS Gill. "Rudder Fish."

Rhombus longipinnis Storer. Synopsis Fishes N. A., p. 109.

Genus PORONOTUS Gill.

PORONOTUS TRIACANTHUS Gill. "Harvest Fish."

Rhombus triacanthus Storer. Synopsis Fishes N. A., p. 110.

Family LEPTUROIDÆ Gill.

Subfamily LEPTURINÆ Gill.

Genus LEPTURUS (Artedi) Linn.

LEPTURUS ARGENTEUS Gill. "Ribbon Fish."

Trichiurus lepturus Storer. Synopsis Fishes N. A., p. 94.

Family SPHYRÆNOIDÆ (Bon.)

Subfamily SPHYRÆNINÆ (Bon.)

Genus SPHYRÆNA Linn.

SPHYRÆNA BOREALIS Dekay. "Barracuda."

Sphyræna borealis Storer. Synopsis Fishes N. A., p. 48.

Family SCOMBROIDÆ (Cuv.)

Subfamily SCOMBRINÆ (Bon.)

Genus SCOMBER (Linn.)

SCOMBER VERNALIS Mitchill. "Spring Mackerel."

Scomber vernalis Storer. Synopsis Fishes N. A., p. 90.

SCOMBER GREX Mitchill.* "Fall Mackerel."

Scomber grex Storer. Synopsis Fishes N. A., p. 90.

SCOMBER DEKAYI Storer.

Scomber colias Storer. Synopsis Fishes N. A., p. 89.

Subfamily ORYCNINÆ Gill.

Genus ORYCNUS Cuv.

ORYCNUS SECUNDI-DORSALIS Gill. "Tunny."

Thynnus vulgaris Storer. Synopsis Fishes N. A., p. 91.

Genus PELAMYS Cuv.

PELAMYS SARDA Cuv. "Bonito."

Pelamys sarda Storer. Synopsis Fishes N. A., p. 91.

Genus APODONTIS Bennett.

APODONTIS MACULATUS Gill. "Spanish Mackerel."

Cybium maculatum Storer. Synopsis Fishes N. A., p. 92.

Subfamily CARANGINÆ (Bon.)

Genus CARANGUS Cuv.

- CARANGUS ESCULENTUS *Girard*.
Caranx carangus Storer. Synopsis Fishes N. A., p. 101.
- CARANGUS HIPPOS *Gill*. "Golden Mackerel."
Caranx chrysos Storer. Synopsis Fishes N. A., p. 101.
- CARANGUS DEFENSOR *Girard*.
Caranx defensor Storer. Synopsis Fishes N. A., p. 102.
- CARANGUS RICHARDI *Girard*.
Caranx Richardi Holbrook. Fishes of South Carolina.
- CARANGUS FALCATUS *Girard*.
Caranx falcatus Holbrook. Fishes of South Carolina.

Genus DECAPTERUS Bleeker.

- DECAPTERUS* PUNCTATUS *Gill*.
Caranx punctatus Storer. Synopsis Fishes N. A., p. 101.

Genus BLEPHARICHTHYS Gill.

- BLEPHARICHTHYS CRINITUS *Gill*. "Shoemaker."
Blepharis crinitus Storer. Synopsis Fishes N. A., p. 103.

Genus ARGYREIOSUS Lac.

- ARGYREIOSUS VOMER *Lac*.
Argyreiosus vomer Storer. Synopsis Fishes N. A., p. 104.
- ARGYREIOSUS CAPILLARIS *Dekay*. "Hair-finned Dory."
Argyreiosus capillaris Storer. Synopsis Fishes N. A., p. 104.
- ARGYREIOSUS UNIMACULATUS *Batchelder*.
Argyreiosus unimaculatus Storer. Synopsis Fishes N. A., p. 271.

Genus SELENE Lac.

- SELENE ARGENTEA *Lac*.
Selene argentea Brevoort. Annals Lyceum Nat. Hist. N. Y.,
 vol. v., p. 68, pl. iv.

Genus VOMER Cuv.

- VOMER SETIPINNIS *Ayres*.
Vomer Brownii Storer. Synopsis Fishes N. A., p. 105.

Subfamily SERIOLINÆ Gill.

Genus ZONICHTHYS Swainson.

- ZONICHTHYS ZONATUS *Gill*.
Seriola zonata Storer. Synopsis Fishes N. A., p. 105.
- ZONICHTHYS BOSCHII *Gill*.
Seriola Boschii Storer. Synopsis Fishes N. A., p. 105.
- ZONICHTHYS FASCIATUS *Swainson*.
Seriola fasciata Storer. Synopsis Fishes N. A., p. 105.
- ZONICHTHYS LEIARCHUS *Gill*.
Seriola leiarchus Storer. Synopsis Fishes N. A., p. 106.
- ZONICHTHYS CAROLINENSIS *Gill*.
Seriola carolinensis Storer. Synopsis Fishes N. A., p. 106.

Genus CHLOROSCOMBRUS Girard.

CHLOROSCOMBRUS COSMOPOLITUS *Girard*.*Seriola cosmopolita* *Storer*. Synopsis Fishes N. A., p. 106.

Genus POMATOMUS Lac.

POMATOMUS SALLATRIX *Gill*. "Blue Fish;" Skip-jack."*Temnodon saltator* *Storer*. Synopsis Fishes N. A., p. 108.Subfamily TRACHYNOTINÆ *Gill*.

Genus TRACHYNOTUS Lac.

TRACHYNOTUS ARGENTEUS *Cuv. and Val*.*Trachinotus argenteus* *Storer*. Synopsis Fishes N. A., p. 98.

Genus DOLIODON Girard.

DOLIODON SPINOSUS *Girard*. "Spinous Dory."*Trachinotus spinosus* *Storer*. Synopsis Fishes N. A., p. 98.DOLIODON CAROLINUS *Girard*.*Lichia carolina* *Storer*. Synopsis Fishes N. A., p. 96.

Genus BOTHROLÆMUS Holbrook.

BOTHROLÆMUS PAMPANUS *Holbrook*.*Trachinotus pampanus* *Storer*. Synopsis Fishes N. A., p. 99.Subfamily CENTRONOTINÆ (*Bon.*)

Genus NAUCRATES Raf.

NAUCRATES DUCTOR *Cuv*. "Pilot Fish."*Naucrates ductor* *Storer*. Synopsis Fishes N. A., p. 96.NAUCRATES NOVEBORACENSIS *Val*. "Pilot Fish."*Naucrates noveboracensis* *Storer*. Synopsis Fishes N. A., p. 96.Subfamily ELACATINÆ *Gill*.Genus ELACATES *Cuv*.ELACATES NIGER *Gill*. "Crab-eater."*Elacates atlanticus* *Storer*. Synopsis Fishes N. A., p. 111.Family ECHENIDOIDÆ (*Bon.*)

Subfamily ECHENIDEINÆ.

Genus ECHENEIS *Linn*.ECHENEIS REMORA *Linn*. "Remora."*Echeneis remora* *Storer*. Synopsis Fishes N. A., p. 232.ECHENEIS BRACHYPTERA *Lowe*.**Echeneis quatuordecim-laminatus* *Storer*. Synopsis Fishes N. A., p. 282.ECHENEIS ALBICAUDA *Mitchill*.*Echeneis albicauda* *Storer*. Synopsis Fishes N. A., p. 231.*Echeneis lineata* *Holbrook*.* Ichthyology of South Carolina, p. 101, pl. xiv., fig. 2.*Echeneis Holbrookii** *Günther*. Annals and Magazine of Nat. Hist., ser. iii., vol. v., p. 400.ECHENEIS NAUCRATES *Linn*.*Echeneis naucrates* *Storer*. Synopsis Fishes N. A., p. 232.

Family XIPHIIDÆ (Bon.)

Subfamily XIPHIINÆ Gill.

Genus XIPHIAS Linn.

XIPHIAS GLADIUS *Linn.* "Sword Fish."Xiphias gladius *Storer.* Synopsis Fishes N. A., p. 95.

Family SCOMBERESOCOIDÆ Rich.

Subfamily SCOMBERESOCINÆ Gill.

Genus SCOMBERESOX Lac.

SCOMBERESOX SCUTELLATUS (*Les.*) "Bill Fish."Scomberesox Storeri *Storer.* Synopsis Fishes N. A., p. 187.

Subfamily BELONINÆ (Bon.)

Genus BELONE Cuv.

BELONE LONGIROSTRIS *Gill.* "Bill Fish," "Gar Fish."Belone truncata *Storer.* Synopsis Fishes N. A., p. 186.

Family EXOCÆTOIDÆ Gill.

Subfamily EXOCÆTINÆ (Bon.)

Genus EXOCÆTUS Linn.

EXOCÆTUS EXILIENS *Gmelin.* "Flying Fish."Exocætus exiliens *Storer.* Synopsis Fishes N. A., p. 189.EXOCÆTUS NOVEBORACENSIS *Mitchill.*Exocætus noveboracensis *Storer.* Synopsis Fishes N. A., p. 188.EXOCÆTUS MELANURUS *Val.*Exocætus melanurus *Cuv. et Val.* Hist. Nat. des Poissons, vol. xix. p. 100.

Genus HALOCYPSELUS Weinland.

HALOCYPSELUS EVOLANS *Gill.* "Flying Fish."Halocypselus evolans *Cuv. et Val.* Hist. Nat. des Poissons, vol. xix. p. 138.

Genus CYPSELURUS Swainson.

CYPSELURUS COMATUS *Weinland.* "Bearded Flying Fish."Exocætus comatus *Storer.* Synopsis Fishes N. A., p. 188.CYPSELURUS FURCATUS *Weinland.*Exocætus furcatus *Storer.* Synopsis Fishes N. A., p. 188.

Family AULOSTOMATOIDÆ Gill.

Subfamily SOLENOSTOMINÆ Gill.

Genus SOLENOSTOMUS Gronovius.

SOLENOSTOMUS TABACARIUS *Gill.* "Pipe Fish."Fistularia tabacaria *Storer.* Synopsis Fishes N. A., p. 191.SOLENOSTOMUS SERRATUS *Gill.*Fistularia serrata *Storer.* Synopsis Fishes N. A., p. 191.

Family CENTRISCOIDÆ Gill.

Subfamily CENTRISCINÆ Gill.

Genus CENTRISCUS Linn.

CENTRISCUS SCOLOPAX Linn.*

Centriscus scolopax Storer. Proc. Boston Society of Nat. Hist.,
vol. vi. p. 178.

Family GASTEROSTEOIDÆ (Bon.)

Subfamily GASTEROSTEINÆ (Bon.)

Genus GASTEROSTEUS (Linn.)

GASTEROSTEUS ACULEATUS Linn. "Stickleback."

Gasterosteus trachurus Storer. Synopsis Fishes N. A., p. 62.

GASTEROSTEUS ACULEATUS Linn., var. dimidiatus Reinhardt.

Gasterosteus aculeatus Fabricius, Fauna Groenlandica, No. 122.

Gasterosteus dimidiatus Reinhardt, Kongelige Danske Videnskaber-
nes Selskabs Nat. og. Math. Afh., vol. vii. p. 114.

GASTEROSTEUS ACULEATUS Linn., var. loricatus Reinhardt.

Gasterosteus loricatus Reinhardt, Kongelige Danske Videnskaber-
nes Selskabs Nat. og. Math. Afh., vol. vii. pp. 114, 119.

GASTEROSTEUS ACULEATUS Linn., var. gymnurus Reinhardt.

Gasterosteus gymnurus Reinhardt, Kongelige Danske Videnska-
bernes Selskabs Nat. og. Math. Afh., vol. vii. p. 193.

GASTEROSTEUS NOVEBORACENSIS Cuv. and Val.

Gasterosteus noveboracensis Storer. Synopsis Fishes N. A., p.
63.

GASTEROSTEUS BIACULEATUS Mitchill.

Gasterosteus biaculeatus Storer. Synopsis Fishes N. A., p. 63.

GASTEROSTEUS NIGER Cuv. and Val.

Gasterosteus niger Storer. Synopsis Fishes N. A., p. 63.

Genus PYGOSTEUS Brevoort, Mss.

PYGOSTEUS OCCIDENTALIS Brevoort.

Gasterosteus occidentalis Cuv. et Val. Hist. Nat. des Poissons,
vol. iv. p. 509.

PYGOSTEUS DEKAYI Brevoort.

Gasterosteus occidentalis Dekay. Zoology of New York: Fishes,
p. 68, pl. xlii. fig. 135.

PYGOSTEUS CUVIERI* Brevoort.

Gasterosteus Cuvieri Girard. Boston Journal of Nat. Hist., vol.
vi. p. 254.

Genus APELTES (Dekay) Brevoort.

APELTES QUADRACUS Brevoort.

Gasterosteus quadracus Storer. Synopsis Fishes N. A., p. 63.

APELTES MILLEPUNCTATUS Brevoort.*

Gasterosteus millepunctatus Storer. Synopsis Fishes N. A., p. 64.

Family POLYNEMATOIDÆ Gill.

Subfamily POLYNEMATINÆ Gill.

Genus TRICHIDION Klein.

TRICHIDION PLUMIERI *Gill*. "Thread Fish."Polynemus Americanus *Storer*. Synopsis Fishes N. A., p. 48.

Family MUGILOIDÆ Richardson.

Subfamily MUGILINÆ (Bon.)

Genus MUGIL Linn.

MUGIL ALBULA *Linn*. "Mullet."Mugil albula *Storer*. Synopsis Fishes N. A., p. 115.MUGIL LINEATUS *Mitchill*. "Mullet."Mugil lineatus *Storer*. Synopsis Fishes N. A., p. 115.MUGIL PETROSUS *Val*.Mugil petrosus *Storer*. Synopsis Fishes N. A., p. 115.MUGIL PLUMIERI *Val*.Mugil Plumieri *Storer*. Synopsis Fishes N. A., p. 116.

Family ATHERINOIDÆ (Bon.)

Subfamily ATHERININÆ (Bon.)

Genus ARGYREA Dekay.

ARGYREA NOTATA *Gill*. "Silver-side."Atherina notata *Storer*. Synopsis Fishes N. A., p. 114.ARGYREA MENIDIA *Gill*.Atherina menidia *Storer*. Synopsis Fishes N. A., p. 114.

Genus ATHERINA (Linn.)

ATHERINA CAROLINA *Val*. "Silver-side," "Sand Smelt."Atherina carolina *Storer*. Synopsis Fishes N. A., p. 114.

Family AMMODYTOIDÆ Gill.

Subfamily AMMODYTINÆ (Bon.)

Genus AMMODYTES Linn.

AMMODYTES AMERICANUS *Dekay*.Ammodytes americanus *Storer*. Synopsis Fishes N. A., p. 237.AMMODYTES DUBIUS *Reinhardt*.*Ammodytes tobianus *Fabricius*. Fauna Grænlantica, p. 140, No. 98.

Subfamily ARGYROTÆNINÆ Gill.

Genus ARGYROTÆNIA Gill.

ARGYROTÆNIA VITTATA *Gill*.Ammodytes vittatus *Storer*. Synopsis Fishes N. A., p. 238.

Family PRIACANTHOIDÆ Gill.

Subfamily PRIACANTHINÆ Gill.

Genus PRIACANTHUS Cuv.

PRIACANTHUS MACROPHthalmus Cuv. "Big-eye."

Family BERYCOIDÆ (Lowe.)

Subfamily HOLOCENTRINÆ (Bon.)

Genus HOLOCENTRUM Artedi.

HOLOCENTRUM SOGHO (Bloch.)

Holocentrum longipinne Storer. Synopsis Fishes N. A., p. 46.

Family SCORPÆNOIDÆ (Sw.)

Subfamily SCORPÆNINÆ (Bon.)

Genus SCORPÆNA Linn.

SCORPÆNA PORCUS Linn.*

Scorpæna porcus Storer. Synopsis Fishes N. A., p. 59.

SCORPÆNA BUFO Cuv.*

Scorpæna bufo Storer. Synopsis Fishes N. A., p. 59.

Genus SEBASTES Cuv.

SEBASTES NORVEGICUS Cuv.

Sebastes norvegicus Storer. Synopsis Fishes N. A., p. 59.

SEBASTES FASCIATUS Storer.

Sebastes fasciatus Storer. Proc. Boston Society of Nat. Hist.,
vol. v., p. 31.

Family COTTOIDÆ Rich.

Subfamily COTTINÆ (Bon.)

Genus ACANTHOCOTTUS (Girard.)

ACANTHOCOTTUS GRÆNLANDICUS Girard. "Sculpin."

Cottus grænlandicus Storer. Synopsis Fishes N. A., p. 53.

ACANTHOCOTTUS LABRADORICUS Girard.* "Sculpin."

Acanthocottus labradoricus Girard. Boston Journal of Nat.
Hist., vol. vi., p. 248.

ACANTHOCOTTUS MUCOSUS Ayres.* "Sculpin."

Acanthocottus mucosus Ayres.

ACANTHOCOTTUS VARIABILIS Ayres.* "Sculpin."

Cottus variabilis Ayres. Boston Journal of Nat. Hist., vol. iv.,
p. 259.

ACANTHOCOTTUS ÆNEUS Girard. "Sculpin."

Cottus æneus Storer. Synopsis Fishes N. A., p. 54.

ACANTHOCOTTUS OCTODECIM-SPINOSUS Gill. "Sculpin."

Cottus virginicanus Storer. Synopsis Fishes N. A., p. 53.

ACANTHOCOTTUS MITCHILLI Girard. "Sculpin."

Cottus Mitchilli Storer. Synopsis Fishes N. A., p. 56.

ACANTHOCOTTUS* SCORPIOIDES *Girard*. "Sculpin."

Cottus scorpioides Storer. Synopsis Fishes N. A., p. 54.

ACANTHOCOTTUS OCELLATUS *H. R. Storer*.

Acanthocottus ocellatus H. R. Storer. Boston Journal of Nat. Hist., vol. vi., p. 253.

ACANTHOCOTTUS GLACIALIS *Gill*.

Cottus glacialis Richardson, in Last of the Arctic Voyages, p. 349. pl. xxiv.

ACANTHOCOTTUS POROSUS *Girard*.

Cottus porosus Storer. Synopsis Fishes N. A., p. 56.

Genus GYMNACANTHUS Swainson.

GYMNACANTHUS PATRIS *Gill*.

Acanthocottus patris H. R. Storer. Boston Journal of Nat. Hist., vol. vi., p. 250, pl. vii., fig. 2.

Genus ———

COTTUS POLARIS *Sabine*.

Cottus polaris Storer. Synopsis Fishes N. A., p. 55.

Genus ONCHOCOTTUS Gill.

ONCHOCOTTUS QUADRICORNIS *Gill*.

Cottus hexacornis Storer. Synopsis Fishes N. A., p. 55.

Genus PHOBETOR Kroyer.

PHOBETOR TRICUSPIS *Kroyer*.

Cottus gobio Fabricius. Fauna Grœnlandica, No. 115.

Genus ICELUS Kroyer.

ICELUS UNCINATUS *Kroyer*.

Cottus uncinatus Reinhardt. Kongelige Danske Videnskabernes Selskabs Nat. og. Math. Afh., vol. viii., p. viii.

ICELUS BICORNIS *Kroyer*.

Cottus bicornis Reinhardt. Kongelige Danske Videnskabernes Selskabs Nat. og. Math. Afh., vol. viii., p. 75.

Genus TRIGLOPS Reinhardt.

TRIGLOPS PINGELII *Reinhardt*.

Triglops pingelii Reinhardt. Kongelige Danske Videnskabernes Selskabs Nat. og. Math. Afh., vol. v., p. 52.

Genus HEMITRIPTERUS Cuv.

HEMITRIPTERUS ACADIANUS *Storer*.

Hemitripterus americanus Storer. Synopsis Fishes N. A., p. 58.

Family AGONOIDÆ (Sw.)

Subfamily AGONINÆ Gill.

Genus AGONUS Bloch.

AGONUS CATAPHRACTUS *Bloch*.

Aspidophorus europæus Storer. Synopsis Fishes N. A., p. 57.

AGONUS SPINOSISSIMUS *Gill.*

Aspidophorus spinosissimus *Kroyer.* Naturhistorisk Tidsskrift, ser. ii., vol. i., p. 250.

Genus *ASPIDOPHOROIDES* *Lac.*

ASPIDOPHOROIDES MONOPTERYGIUS *Storer.*

Aspidophorus monopterygius *Storer.* Synopsis Fishes N. A., p. 57.

Family *TRIGLOIDÆ* (*Bon.*)

Subfamily *TRIGLINÆ* (*Bon.*)

Genus *TRIGLA* *Linn.*

TRIGLA CUCULUS *Linn.**

Trigla cuculus *Storer.* Synopsis Fishes N. A., p. 50.

Genus *PRIONOTUS* *Lac.*

PRIONOTUS LINEATUS *Decay.* "Flying Fish."

Prionotus lineatus *Storer.* Synopsis Fishes N. A., p. 50.

PRIONOTUS CAROLINUS *Cuv. and Val.*

Prionotus carolinus *Storer.* Synopsis Fishes N. A., p. 51.

PRIONOTUS PILATUS *Storer.*

Prionotus pilatus *Storer.* Proc. Boston Society of Nat. Hist. vol. ii., p. 77.

PRIONOTUS PUNCTATUS *Cuv. and Val.*

Prionotus punctatus *Storer.* Synopsis Fishes N. A., p. 51.

PRIONOTUS TRIBULUS *Cuv. and Val.*

Prionotus tribulus *Storer.* Synopsis Fishes N. A., p. 51.

Subfamily *DACTYLOPTERINÆ* *Lac.*

Genus *DACTYLOPTERUS* *Lac.*

DACTYLOPTERUS VOLITANS *Lac.** "Flying Fish."

Dactylopterus volitans *Storer.* Synopsis Fishes N. A., p. 52.

Family *URANOSCOPOIDÆ* (*Rich.*)

Subfamily *URANOSCOPINÆ* (*Bon.*)

Genus *ASTROSCOPUS* *Brev.*

ASTROSCOPUS ANOPLUS *Brev.* "Stay-gazer."

Uranoscopus anoplas *Storer.* Synopsis Fishes N. A., p. 46.

ASTROSCOPUS GUTTATUS *Abbott.**

Astroscopus guttatus *Abbott.* Proceedings of the Acad. of Nat. Sciences of Philadelphia, 1860, pl. 7.

Family *BATRAHOIDÆ* (*Rich.*)

Subfamily *BATRACHINÆ* (*Bon.*)

Genus *BATRACHUS* *Linn.*

BATRACHUS TAU *Linn.* "Toad Fish," "Oyster Fish."

Batrachus tau *Storer.* Synopsis Fishes N. A., p. 132.

BATRACHUS VARIEGATUS *Val.**

Batrachus variegatus *Storer.* Synopsis Fishes N. A., p. 133.

BATRACHUS CELATUS *Decay.**

Batrachus celatus *Storer.* Synopsis Fishes N. A., p. 133.

Family GOBIOIDÆ (Bon.)

Subfamily GOBINÆ (Bon.)

Genus GOBIOSOMA Girard.

GOBIOSOMA ALEPIDOTUM *Girard*. "Goby."Gobius alepidotus *Storer*. Synopsis Fishes N. A., p. 125.

Subfamily ELEOTRIDINÆ Ag.

Genus DORMITATOR Gill.

DORMITATOR SOMNULENTUS *Gill*.Eleotris somnulentus *Girard*. Ichthyology of United States and Mexican Boundary Survey, p. 28, pl. xii. figs. 1—3.

Family BLENNIOIDÆ (Bon.)

Subfamily BLENNINÆ (Bon.)

Genus BLENNIUS Linn.

BLENNIUS* FUCORUM *Cuv. and Val.** "Blenny."Blennius fucorum *Storer*. Synopsis Fishes N. A., p. 117.BLENNIUS* GEMINATUS *Wood*.Blennius geminatus *Storer*. Synopsis Fishes N. Y., p. 117.

Genus HYPLEUROCHILUS Gill.

HYPLEUROCHILUS MULTIFILIS *Gill*.Blennius multifilis *Girard*. Ichthyology of United States and Mexican Boundary Survey, p. 27, pl. xii. fig. 6.HYPLEUROCHILUS* PUNCTATUS *Gill*.Blennius punctatus *Storer*. Synopsis Fishes N. A., p. 117.

Genus HYPSOBLENNIUS Gill.

HYPSOBLENNIUS HENTZI *Gill*.Blennius Hentz *Lesueur*. Journal of Acad. Nat. Sciences of Phila., vol. iv. p. 363.

Genus CHASMODES Cuv. and Val.

CHASMODES BOSQUIANUS *Cuv. and Val.*Chasmodes Bosquianus *Storer*. Synopsis Fishes N. A., p. 118.CHASMODES QUADRIFASCIATUS *Val.*Chasmodes quadrifasciatus *Storer*. Synopsis Fishes N. A., p. 119.CHASMODES NOVELLINEATUS *Val.*Chasmodes novemlineatus *Storer*. Synopsis Fishes N. A., p. 119.

Genus PHOLIS Artedi.

PHOLIS CAROLINUS *Val.*Pholis carolinus *Storer*. Synopsis Fishes N. A., p. 118.

Genus LEPTOBLENNIUS Gill.

LEPTOBLENNIUS SERPENTINUS *Gill*.Blennius serpentinus *Storer*. Proc. Boston Soc. of Nat. Hist., vol. iii. p. 30.

Genus MURÆNOIDES Lac.

MURÆNOIDES AFFINIS *Gill*. "Butter Fish."

Gunnellus affinis *Reinhardt*. Kongelige Danske Videnskabernes
Selskabs Nat. og. Math. Afh., vol. vii. pp. 114, 223.

MURÆNOIDES FASCIATUS *Gill*.

Gunnellus grœnlandicus *Storer*. Synopsis Fishes N. A., p. 122.

MURÆNOIDES MACROCEPHALUS *Gill*.*

Gunnellus macrocephalus *Girard*. Boston Journal of Nat. Hist.,
vol. vi. p. 263.

MURÆNOIDES MUCRONATUS *Gill*.

Gunnellus mucronatus *Storer*. Synopsis Fishes N. A., p. 122.

MURÆNOIDES INGENS *H. R. Storer*.*

Gunnellus ingens *H. R. Storer*. Boston Journal of Nat. Hist.,
vol. vi. p. 26.

Genus CENTROBLENNIUS Gill.

CENTROBLENNIUS NUBILUS *Gill*.

Lumpenus nubilus *Richardson*, in Last of the Artic Voyages, p.
359, pl. xxviii.

CENTROBLENNIUS NEBULOSUS *Gill*.

Lumpenus gracilis *Reinhardt, senr.* Kongelige Danske Videnska-
bernes Selskabs Nat. og. Math. Afh., vol. vii. p. 194.

Genus LUMPENUS Reinhardt.

LUMPENUS FABRICII *Reinhardt*.

Gunnellus Fabricii *Storer*. Synopsis Fishes N. A., p. 121.

LUMPENUS MEDIUS *Reinhardt*.

Lumpenus medius *Reinhardt*. Kongelige Danske Videnskaber-
nes Selskabs Nat. og. Math. Afh., vol. vii. p. 121.

Genus LEPTOCLINUS Gill.

LEPTOCLINUS MACULATUS *Gill*.

Lumpenus aculeatus *Reinhardt*. Kongelige Danske Videnskaber-
nes Selskabs Nat. og. Math. Afh., vol. vii. p. 122.

Genus STICHÆUS Reinhardt.

STICHÆUS PUNCTATUS *Kroyer*.

Gunnellus punctatus *Storer*. Synopsis Fishes N. A., p. 121.

STICHÆUS PRÆCISUS *Kroyer*.

Stichæus præcisus *Kroyer*. Naturhistorisk Tidsskrift, ser. i. vol.
i. p. 25.

STICHÆUS SUBBIFURCATUS *Gill*.

Pholis subbifurcatus *Storer*. Synopsis Fishes N. A., p. 118.

Subfamily ZOARCEINÆ Gill.

Genus ZOARCES Cuv.

ZOARCES ANGUILLARIS *Storer*. "Ling," "Conger Eel."

Zoarces anguillaris *Storer*. Synopsis Fishes N. A., p. 123.

ZOARCES CILIATUS *Gill*.

Zoarces fimbriatus *Storer*. Synopsis Fishes N. A., p. 123.

Subfamily LYCODINÆ Gill.

Genus LYCODES Reinhardt.

LYCODES VAHLII *Reinhardt*.

Lycodes VahlII Reinhardt. Kongelige Danske Videnskabernes Selskabs Nat. og. Math. Afh., vol. vii. p. 153, pl. v.

LYCODES RETICULATUS *Reinhardt*.

Lycodes reticulatus Reinhardt. Kongelige Danske Videnskabernes Selskabs Nat. og. Math. Afh., vol. vii. p. 167, pl. vi.

LYCODES SEMINUDUS *Reinhardt*.

Lycodes seminudus Rheinhardt. Kongelige Danske Videnskabernes Selskabs Nat. og. Math. Afh., vol. vii. p. 223.

LYCODES PERSPICILLUM *Kroyer*.

Lycodes perspicillum Kroyer. . Oversigt over det Kgl. Danske Videnskabernes Selskabs, &c., 1844, p. 140.

LYCODES NEBULOSUS *Kroyer*.

Lycodes nebulosus Kroyer. Oversigt over det Kgl. Danske Videnskabernes Selskabs, &c., 1844, p. 140.

LYCODES MUCOSUS *Richardson*.*

Lycodes mucosus Richardson, in Last of the Artic Voyages, p. 362, pl. xxvi. pp. 1—5.

LYCODES* POLARIS *Richardson*.*

Blennius polaris Sabine, in Parry's Journal of a Voyage for the discovery of a Northwest Passage, &c., performed in 1819--20, &c., Supplement to Appendix, p. cxii.

Subfamily ANARRHICANINÆ Gill.

Genus ANARRHICAS Linn.

ANARRHICAS LUPUS *Linn*. "Wolf Fish."

Anarrhicas lupus Fabricius. Fauna Groenlandica.

ANARRHICAS VOMERINUS (*Ag.*) *Storer*.* "Wolf Fish."

Anarrhicas lupus partim Storer. Synopsis Fishes N. A., p. 124.

ANARRHICAS DENTICULATUS *Kroyer*.

Anarrhicas denticulatus Kroyer. Oversigt over det Kgl. Danske Videnskabernes Selskabs, &c., 1844, p. 140.

ANARRHICAS STEENSTRUPII *Gill*.

Anarrhicas minor Fabricius. Fauna Groenlandica, No. 97.

Family CRYPTACANTHOIDÆ Gill.

Subfamily CRYPTACANTHINÆ Gill.

Genus CRYPTACANTHODES *Storer*.CRYPTACANTHODES MACULATUS *Storer*.

Cryptacanthodes maculatus Storer. Synopsis Fishes N. A., p. 58.

Family LOPHIROIDÆ (Bon.)

Subfamily LOPHIINÆ (Bon.)

Genus LOPHIUS Linn.

LOPHIUS AMERICANUS *Val*. "Angler."

Lophius americanus Storer. Synopsis Fishes N. A., p. 129.

Subfamily MALTHEINÆ Gill.

Genus MALTHEA Cuv.

MALTHEA VESPERTILIO *Cuv.* "Bat Fish."Malthea vespertilio *Storer.* Synopsis Fishes N. A., p. 131.MALTHEA RADIATA *Gill.* "Bat Fish."Malthea nasuta *Storer.* Synopsis Fishes N. A., p. 132.MALTHEA NOTATA *Val.*Malthea notata *Storer.* Synopsis Fishes N. A., p. 132.

Subfamily ANTENNARIINÆ Gill.

Genus ANTENNARIUS Com.

ANTENNARIUS VARIEGATUS *Gill.* "Mouse Fish."Chironectes lævigatus *Storer.* Synopsis Fishes N. A., p. 130.ANTENNARIUS GIBBUS *Gill.*Chironectes gibbus *Storer.* Synopsis Fishes N. A., p. 130.

Subfamily CERATIANÆ Gill.

Genus CERATIAS Holboll.

CERATIAS HOLBOLLII *Kroyer.*Ceratias Holbollii *Kroyer.* Naturhistorisk Tidsskrift, ser. ii. vol. i. p. 639.

Subfamily HIMANTOLOPHINÆ Gill.

Genus HIMANTOLOPHUS Reinhardt.

HIMANTOLOPHUS GRÆNLANDICUS *Reinhardt.*Himantolophus grænlanticus *Reinhardt.* Kongelige Danske Videnskabernes Selskabs Nat. og. Math. Aft., vol. vii.

Family CYCLOPTEROIDÆ (Bon.)

Subfamily CYCLOPTERINÆ (Bon.)

Genus CYCLOPTERUS Linn.

CYCLOPTERUS LUMPUS *Linn.* "Lump Fish."Lumpus anglorum *Storer.* Synopsis Fishes N. A., p. 229.CYCLOPTERUS SPINOSUS *Fabricius.*Lumpus spinosus *Storer.* Synopsis Fishes N. A., p. 230.

Subfamily LIPARINÆ Gill.

Genus LIPARIS Artedi.

LIPARIS FABRICII *Kroyer.*Liparis communis *Storer.* Synopsis Fishes N. A., p. 230.LIPARIS GELATINOSUS *Pallas.*Liparis gelatinosus *Storer.* Synopsis Fishes N. A., p. 231.

(Suborder ANACANTHINI Müller.)

Family GADOIDÆ (Cuv.)

Subfamily GADINÆ (Bon.)

Genus GADUS Linn.

- GADUS MORRHUA *Linn.* "Bank Codfish."
Morrhua vulgaris Storer. Synopsis Fishes N. A., p. 216.
- GADUS AMERICANUS *Gill.** "Codfish."
Morrhua americana Storer. Synopsis Fishes N. A., p. 215.
- GADUS PRUINOSUS *Mitchill.* "Tom Cod."
Morrhua pruinosa Storer. Synopsis Fishes N. A., p. 216.
- GADUS MINUTUS *Linn.*
Morrhua minuta Storer. Synopsis Fishes N. A., p. 217.
- GADUS OJAC *Richardson.*
Morrhua ojac Storer. Synopsis Fishes N. A., p. 217.
- GADUS ÆGLIFINUS *Linn.* "Haddock."
Morrhua æglifinus Storer. Synopsis Fishes N. A., p. 215.
- GADUS FABRICII *Richardson.*
Morrhua Fabricii Storer. Synopsis Fishes N. A., p. 217.

Genus MERLANGUS Cuv.

- MERLANGUS PURPUREUS *Storer.*
Merlangus purpureus Storer. Synopsis Fishes N. A., p. 220.
- MERLANGUS LEPTOCEPHALUS *Dekay.**
Merlangus leptocephalus Storer. Synopsis Fishes N. A., p. 221.

Genus POLLACHIUS Bon.

- POLLACHIUS CARBONARIUS *Bon.* "Coal Fish."
Merlangus carbonarius Storer. Synopsis Fishes N. A., p. 220.
- POLLACHIUS POLARIS *Gill.*
Merlangus polaris Storer. Synopsis Fishes N. A., p. 220.

Genus MERLUCIUS Raf.

- MERLUCIUS VULGARIS *Fleming.* "Hake."
Merlucius vulgaris Reinhardt. Naturhistoriske Bidrag, &c., of
 Grønland, p. 24.
- MERLUCIUS BILINEARIS* *Gill.* "Hake."
Merlucius albidus Storer. Synopsis Fishes N. A., p. 218.

Genus LOTA Cuv.

- LOTA MOLVA *Cuv.*
Lota molva Fabricius. Fauna Grønlandica, No. 106.

Genus MOTELLA Cuv.

- MOTELLA REINHARDI (*Kroyer.*)
Motella mustela Reinhardt. Kongelige Danske Videnskabernes
 Selskabs Nat. og. Math., vol. vii., p. 115.
- MOTELLA ENSIS *Reinhardt.*
Motella ensis Reinhardt. Kongelige Danske Videnskabernes
 Selskabs Nat. og. Math., vol. vii., p. 115, 128.

MOTELLA ARGENTATA Reinhardt.

Motella argentata Reinhardt. Kongelige Danske Videnskabernes
Selskabs Nat. og. Math., vol. vii., pp. 115, 128.

*MOTELLA CAUDACUTA Storer.**

Motella caudacuta Storer. Proc. Boston Society of Nat. Hist.,
1848, p. 5.

Genus *BROSMIUS* Cuv.

BROSMIUS BROSMIE White.

Brosmius vulgaris Storer. Synopsis Fishes N. A.,

BROSMIUS FLAVESCENS Lesueur.

Brosmius flavescens Storer. Synopsis Fishes N. A., p. 221.

Subfamily *PHYCINÆ* Sw.

Genus *PHYCIS* Artedi.

PHYCIS AMERICANUS Cuv.

Phycis americanus Storer. Synopsis Fishes N. A., p. 221.

PHYCIS DEKAYI Kaup.

Phycis Dekayi Kaup. Archiv für Naturgeschichte, 1858, vol. i.,
p. 89.

PHYCIS TENUIS Dekay.

Phycis tenuis Storer. Synopsis Fishes N. A., p. 222.

PHYCIS REGALIS Kaup.

Phycis punctatus Storer. Synopsis Fishes N. A., p. 222.

Subfamily *BYTHITINÆ* Gill.

Genus *BYTHITES* Reinhardt.

BYTHITES FUSCUS Reinhardt.

Bythites fuscus Reinhardt. Kongelige Danske Videnskabernes
Selskabs Nat. og. Math. Afh., vol. vii., p. 175.

Family *MACRUROIDÆ* (Bon.)

Subfamily *MACRURINÆ* (Bon.)

Genus *MACRURUS* Bloch.

MACRURUS RUPESTRIS Bloch.

Macrurus rupestris Storer. Synopsis Fishes N. A., p. 222.

MACRURUS NORVEGICUS Bon.

Macrurus Strœmii Reinhardt. Oversigt over det Kgl. Danske
Videnskabernes Selskabs, &c., 1844, p. 140.

Family *OPHIDIIDOIDÆ* Bon.

Subfamily *OPHIDIINÆ* Bon.

Genus *OPHIDIUM* Linn.

OPHIDIUM MARGINATUM Dekay.

Ophidium marginatum Storer. Synopsis Fishes N. A., p. 235.

(Suborder PHARYNGOGNATHI Müller.)

Family LABROIDÆ (Cuv.)

Subfamily LABRINÆ (Bon.)

Genus TAUTOGA (Mitchill) Val.

TAUTOGA AMERICANA *Dekay*. "Tautog," "Black Fish."Tautoga americana *Storer*. Synopsis Fishes N. A., p. 137.

Genus CTENOLABRUS Val.

CTENOLABRUS BURGALL *Gill*. "Cunner."Ctenolabrus ceruleus *Storer*. Synopsis Fishes N. A., p. 134.

Subfamily XYRICHTHYINÆ Gill.

Genus XYRICHTHYS Cuv.

XYRICHTHYS LINEATUS *Val*.Xyrichthys lineatus *Storer*. Synopsis Fishes N. A., p. 141.

Suborder HETEROSOMATA (Bon.)

Family PLEURONECTOIDÆ (Bon.)

Subfamily PLEURONECTINÆ (Bon.)

Genus HIPPOGLOSSUS Cuv.

HIPPOGLOSSUS VULGARIS *Cuv*.Hippoglossus vulgaris *Storer*. Synopsis Fishes N. A., p. 223.

Genus REINHARDTIUS Gill.

REINHARDTIUS HIPPOGLOSSOIDES *Gill*.Pleuronectes cynoglossus *Fabricius*. Fauna Grœnlandica, p. 163, No. 118.

Genus CHÆNOPSETTA Gill.

CHÆNOPSETTA OBLONGA *Gill*.Platessa oblonga *Storer*. Synopsis Fishes N. A., p. 225.CHÆNOPSETTA OBLONGA *Gill*, var. ocellaris.Platessa oblonga (partim) *Storer*. Synopsis Fishes N. A., p. 225.

Genus HIPPOGLOSSOIDES Gottsche.*

HIPPOGLOSSOIDES DENTATUS* *Gill*.Platessa dentata *Storer*. Synopsis Fishes N. A., p. 224.

Genus DREPANOPSETTA Gill.

DREPANOPSETTA PLATESSOIDES *Gill*.Pleuronectes platessoides *Fabricius*. Fauna Grœnlandica, p. 164, No. 119.

Genus PLEURONECTES (Artedi) (non Bonap.)

PLEURONECTES AMERICANUS *Walbaum*.Platessa plana *Storer*. Synopsis Fishes N. A., p. 222.

PLEURONECTES PUSILLUS Gill.

Platessa pusilla Storer. Synopsis Fishes N. A., p. 223.

Genus MYZOPSETTA Gill.

MYZOPSETTA FERRUGINEA Gill.

Platessa ferruginea Storer. Synopsis Fishes N. A., p. 224.

*MYZOPSETTA** *ROSTRATA* Gill.

Platessa rostrata H. R. Storer. Boston Journal of Nat. Hist., vol. vi., p. 268.

Pleuronectinae of Uncertain Genus.

PLATESSA GLABRA Storer. Proc. Boston Society of Nat. Hist., 1843, p. 130.

PLATESSA QUADROULARIS Storer. Proc. Boston Society of Nat. Hist., 1847, p. 242.

Subfamily RHOMBINÆ Gill.

Genus LOPHOPSETTA Gill.

LOPHOPSETTA MACULATA Gill.

Pleuronectes maculatus Storer. Synopsis Fishes N. A., p. 227.

Subfamily SOLEINÆ (Bon.)

Genus GRAMMICHTHYS Kaup.

GRAMMICHTHYS LINEATUS Kaup.

Achirus mollis Storer. Synopsis Fishes N. A., p. 228.

Subfamily PLAGIUSIINÆ (Bon.)

Genus GLOSSICHTHYS Gill.

GLOSSICHTHYS PLAGIUSA Gill.

Plagusia fasciata Storer. Synopsis Fishes N. A., p. 228.

Suborder PHYSOSTOMI (Müller.)

Family CYPRINODONTOIDÆ.

Subfamily CYPRINODONTINÆ Gill.

Genus CYPRINODON Lac.

CYPRINODON VARIEGATUS Lac. "Killie Fish."

Lebias ellipsoides (Les.) Storer. Synopsis Fishes N. A., p. 179.

Cyprinodon variegatus (Lac.) Storer. Synopsis Fishes N. A., p. 183.

CYPRINODON PARVUS Baird and Girard.

Cyprinodon parvus Baird. Ninth Annual Report of Smithsonian Inst., p. 345.

Subfamily HYDRARGYRINÆ Gill.

Genus HYDRARGYRA (Lac.)

HYDRARGYRA SWAMPINA Lac. "Killifish."

Hydrargyra swampina Cuv. et Val. Hist. Nat. des Poissons, vol. xviii., p. 203.

HYDRARGYRA MAJALIS *Val.*

Hydrargyra flavula Storer. Synopsis Fishes N. A., p. 180.

HYDRARGYRA LUCIÆ *Baird.*

Hydrargyra Luciae Baird. Ninth Annual Report of Smithsonian Inst., p. 345.

Genus FUNDULUS (Lac.)

FUNDULUS HETEROCLITUS *Gill.* "Killifish."

Hydrargyra fasciata Storer. Synopsis Fishes N. A., p. 180.

FUNDULUS PISCULENTUS *Val.**

Hydrargyra pisculenta Storer. Synopsis Fishes N. A., p. 180.

FUNDULUS ZONATUS *Val.**

Esox zonatus Mitchell. Transactions of Literary and Philosophical Society of N. Y., vol. i., p. 433.

Fundulus zonatus Cuv. et Val. Hist. Nat. des Poissons, vol. xviii., p. 196.

FUNDULUS CINGULATUS *Val.*

Fundulus cingulatus Cuv. et Val. Hist. Nat. des Poissons, vol. xviii., p. 197.

FUNDULUS DIAPHANUS *Ag.*

Hydrargyra diaphana Storer. Synopsis Fishes N. A., p. 181.

FUNDULUS MULTIFASCIATUS *Val.*

Hydrargyra multifasciata Storer. Synopsis Fishes N. A., p. 181.

Family SALMONOIDÆ (Cuv.)

Subfamily SALMONINÆ (Bon.)

Genus SALMO Linn.

SALMO SALAR *Linn.* "Salmon."

Salmo salar Storer. Synopsis Fishes N. A., p. 192.

SALMO HAMATUS *Cuv.**

Salmo hamatus Brevoort. Notes on some Figures of Japanese Fish.

SALMO CARPIO *Linn.*

Salmo carpio Fabricius. Fauna Grœnlandica, p. 170, No. 124.

SALMO ALPINUS *Linn.*

Salmo alpinus Fabricius. Fauna Grœnlandica, p. 173, No. 125.

SALMO STAGNALIS *Fabricius.*

Salmo stagnalis Fabricius. Fauna Grœnlandica, p. 175, No. 126.

SALMO RIVALIS *Fabricius.*

Salmo rivalis Fabricius. Fauna Grœnlandica, p. 176, No. 127.

SALMO HEARNII *Richardson.*

Salmo Hearnii Storer. Synopses Fishes N. A., p. 194.

SALMO ALIPES *Richardson.*

Salmo alipes Storer. Synopsis Fishes N. A., p. 195.

SALMO NITIDUS *Richardson.*

Salmo nitidus Storer. Synopsis Fishes N. A., p. 195.

SALMO HOODII *Richardson.*

Salmo Hoodii Storer. Synopsis Fishes N. A., p. 195.

SALMO PENSHINENSIS *Pallas.*

Salmo Rossii Storer. Synopsis Fishes N. A., p. 194.

SALMO IMMACULATUS *H. R. Storer.*

Salmo immaculatus H. R. Storer. Boston Journal of Nat. Hist.,
vol. vi., p. 269.

Genus **OSMERUS** Artedi.

OSMERUS MORDAX *Gill.* "Smelt."

Osmerus viridescens Storer. Synopsis Fishes N. A., p. 197.

Subfamily **ARGENTININÆ** Gill.

Genus **MALLOTUS** Cuv.

MALLOTUS VILLOSUS *Cuv.* "Capelin."

MalLOTus villosus Storer. Synopsis Fishes N. A., p. 202.

Family **SYNODONTOIDÆ** Gill.

Subfamily **SYNODONTINÆ** Gill.

Genus **SYNODUS** Gronovius.

SYNODUS FÆTENS *Gill.*

Saurus mexicanus Storer. Synopsis Fishes N. A., p. 203.

Genus **TRACHINOCEPHALUS** Gill.

TRACHINOCEPHALUS MYOPS *Gill.*

Saurus myops Cuv. et Val. Hist. Nat. des Poissons, vol. xxii.,
p. 485.

Family **SCOPELOIDÆ** (Bon.)

Subfamily **SCOPELINÆ** (Bon.)

Genus **SCOPELUS** Cuv.

SCOPELUS MULLERI *Gill.**

Scopelus Humboldtii Storer. Synopsis Fishes N. A., p. 198.

SCOPELUS GLACIALIS *Reinhardt.*

Scopelus glacialis Reinhardt. Kongelige Danske Videnskabernes
Selskabs Nat. og. Math. Afh., vol. vi., p. 110.

Labiis exoletus Fabricius. Fauna Grœnlandica, p. 166, No. 120,
(not "*Acantholabrus exoletus*, Val.," *Storer.*)

Family **PARALEPIDOIDÆ** Gill.

Subfamily **PARALEPIDINÆ** (Bon.)

Genus **PARALEPIS** Risso.

PARALEPIS BOREALIS *Reinhardt.*

Paralepis borealis Reinhardt. Kongelige Danske Videnskabernes
Selskabs Nat. og. Math. Afh., vol. vii., pp. 115, 125.

Family **CHAULIODONTOIDÆ** (Bon.)

Subfamily **STOMIANÆ** Gill.

Genus **STOMIAS** Cuv.

STOMIAS FEROX *Reinhardt.*

Stomias ferox Reinhardt. Kongelige Danske Videnskabernes
Selskabs Nat. og. Math. Afh., vol. x., p. 78.

Family MICROSTOMATOIDÆ Gill.

Subfamily MICROSTOMATINÆ Gill.

Genus MICROSTOMA Risso.

MICROSTOMA GRÆNLANDICUM (*Reinhardt*.)

Microstomus grænlanticus Reinhardt. Kongelige Danske Videnskabernes Selskabs Nat. og. Math. Afh., vol., viii., p. 74.

Family CLUPÆOIDÆ (Val.)

Subfamily CLUPÆINÆ (Bon.)

Genus CLUPEA (Linn.)

CLUPEA ELONGATA *Lesueur*. "Herring."

Clupea elongata Storer. Synopsis Fishes N. A., p. 204.

Clupea minima Storer. Synopsis Fishes N. A., p. 205.

CLUPEA HARENGUS *Linn*. "Herring."

Clupea harengus Storer. Synopsis Fishes N. A., p. 206.

Genus ALAUSELLA Gill.

ALAUSELLA PARVULA *Gill*.

**Clupea parvulus Storer*. Synopsis Fishes N. A., p. 205.

Genus MELETTA Val.

MELETTA MATTOWACCA *Val*. "Fall Herring."

Alosa mattowacca Storer. Synopsis Fishes N. A., p. 207.

MELETTA VENOSA *Val*.

Meletta venosa Cuv. et Val. Hist. Nat. des Poissons, vol. vii., p. 374.

Genus OPISTHONEMA Gill.

OPISTHONEMA THRISSE *Gill*. "Thread Herring."

Chatoëssus oglina Storer. Synopsis Fishes N. A., p. 209.

Chatoëssus notatus Storer. Synopsis Fishes N. A., p. 209.

Chatoëssus signifer Storer. Synopsis Fishes N. A., p. 210.

Genus ALAUSA (Cuv.) Val.

ALAUSA SAPIDISSIMA (*Storer*.) Shad.

Alosa sapidissima Storer. Synopsis Fishes N. A., p. 206.

ALAUSA* VIRESCENS *Gill*.

Clupea virescens Storer. Synopsis Fishes N. A., p. 204.

ALAUSA* CYANONOTON (*Storer*.)

Alosa cyanonoton Storer. Proc. Boston Society of Nat. Hist., vol. ii. p. 242.

ALAUSA TYRANNUS (*DeKay*.) "Alewife."

Alosa tyrannus Storer. Synopsis Fishes N. A., p. 207.

ALAUSA* LINEATA *Storer*.

Alosa lineata Storer. Proc. Boston Society of Nat. Hist., vol. ii., p. 242.

ALAUSA FASCIATA *Gill*.

Clupea fasciata Storer. Synopsis Fishes N. A., p. 204.

Alosa teres Cuv. et Val. Hist. Nat. des Poissons, vol. xx. p. 423.
(non *Alosa teres DeKay*.)

Genus BREVOORTIA Gill.

BREVOORTIA MENHADEN Gill. "Mossbanker."

Alosa menhaden Storer. Synopsis Fishes N. A., p. 207.

Alosa sadina Storer. Synopsis Fishes N. A., p. 208.

Clupea cœrulea Storer. Synopsis Fishes N. A., p. 205.

Subfamily ENGRAULINÆ Gill.

Genus ENGRAULIS Cuv.

ENGRAULIS VITTATUS Baird and Girard. "Anchovy."

Clupea vittata Storer. Synopsis Fishes N. A., p. 205.

ENGRAULIS BROWNII Val.

Engraulis Brownii Cuv. et Val. Hist. Nat. des Poissons, vol. xxi., p. 41.

Subfamily DOROSOMATINÆ Gill.

Genus DOROSOMA (Raf.)

DOROSOMA CEPEDIANUM Gill.

Chatoëssus Cepedianus Storer. Synopsis Fishes N. A., p. 209.

Chatoëssus ellipticus Storer. Synopsis Fishes N. A., p. 210.

DOROSOMA INSOCIABILE Gill.*

Chatoëssus insociabilis Abbott. Proceedings of the Academy of Natural Sciences of Phila., 1860.

Family CONORHYNCHOIDÆ Gill.

Subfamily CONORHYNCHINÆ Gill.

Genus CONORHYNCHUS Nozeman.

CONORHYNCHUS MACROCEPHALUS Gill.

Butrinus vulpes Storer. Synopsis Fishes N. A., p. 212.

Subfamily DUSSUMIERINÆ Gill.

Genus ETRUMEUS Bleeker.

ETRUMEUS TERES Brevoort.

Alosa teres Storer. Synopsis Fishes N. A., p. 208.

Family ELOPOIDÆ (Val.)

Subfamily ELOPINÆ Gill.

Genus ELOPS Linn.

ELOPS SAURUS Linn.

Elops saurus Storer. Synopsis Fishes N. A., p. 211.

Genus MEGALOPS Lac.

MEGALOPS ELONGATUS Girard.

Megalops elongatus Girard. Proceedings of the Academy of Natural Sciences of Phila., 1858, p. —, 1859, p. 64.

Order APODES Kaup.

Family ANGUILLOIDÆ Sarrell.

Subfamily CONGERINÆ Gill.

Genus CONGER Cuv.

CONGER OCCIDENTALIS DeKay. "Conger."

Conger occidentalis Storer. Synopsis Fishes N. A., p. 235.

Genus ISOGNATHA (DeKay.)*

ISOGNATHA OCEANICA DeKay.

Anguilla oceanica Storer. Synopsis Fishes N. A., p. 234.

Subfamily ANGUILLINÆ (Raf.)

Genus ANGUILLA Thunberg.

ANGUILLA BOSTONIENSIS DeKay. "Eel."

Anguilla bostoniensis Storer. Synopsis Fishes N. A., p. 233.

ANGUILLA MACROCEPHALA DeKay. "Bull-head Eel."

Anguilla macrocephala Storer. Synopsis Fishes N. A., p. 234.

ANGUILLA SERPENTINA Storer.

Anguilla serpentina Storer. Synopsis Fishes N. A., p. 234.

ANGUILLA ARGENTEA DeKay. "Eel."

Anguilla argentea Storer. Synopsis Fishes N. A., p. 233.

ANGUILLA NOVÆ-TERREÆ Kaup.*

Anguilla novæ-terreæ Kaup. Catalogue of Apodal Fish in British Museum, p. 45.

Order LEMNISCATI.

Family LEPTOCEPHALOIDÆ (Bon.)

Subfamily LEPTOCEPHALINÆ (Bon.)

Genus LEPTOCEPHALUS Gron.

LEPTOCEPHALUS GRACILIS Storer.

Leptocephalus gracilis Storer. Synopsis Fishes N. A., p. 272.

Order NEMATOGNATHI Gill.

Family SILUROIDÆ (Cuv.) Blkr.

Subfamily BAGRINÆ Blkr.

Genus AILURICHTHYS Baird and Girard.

AILURICHTHYS MARINUS Baird and Girard. "Catfish."

Galeichthys marinus Storer. Synopsis Fishes N. A., p. 149.

Genus ARIOPSIS Gill.

ARIOPSIS MILBERTI Gill. "Catfish."

Arius milberti Storer. Synopsis Fishes N. A., p. 149.

Order PLECTOGNATHI Cuv.

Family BALISTOIDÆ Cuv.

Subfamily BALISTINÆ (Bon.)

Genus CAPRISCUS Linn.

CAPRISCUS FULIGINOSUS Gill. "File Fish."

Balistis fuliginosus Storer. Synopsis Fishes N. A., p. 243.

Subfamily MONACANTHINÆ Kaup.

Genus CANTHORHINUS (Sw.)

CANTHORHINUS MASSACHUSETTENSIS Gill. "File Fish."

Monachanthus massachusettsensis Storer. Synopsis Fishes N. A., p. 244.

CANTHORHINUS BROCCUS *Gill.*

Monacanthus broccus *Storer.* Synopsis Fishes N. A., p. 244.

CANTHORHINUS SIGNIFER *Gill.*

Monacanthus signifer *Storer.* Synopsis Fishes N. A., p. 245.

Genus CERATACANTHUS *Gill.*

CERATACANTHUS AURANTIACUS *Gill.*

Monacanthus aurantiacus *Storer.* Synopsis Fishes N. A., p. 241.

Genus ALUTERA *Cuv.*

ALUTERA CUSPICAUDA (*Dekay.*)

Aluteres cuspicauda *Storer.* Synopsis Fishes N. A., p. 245.

Family OSTRACIONTOIDÆ (*Cuv.*)

Subfamily OSTRACIONTINÆ (*Bon.*)

Genus TETRASOMUS *Sw.*

TETRASOMUS CAMELINUS *Gill.* "Trunk Fish."

Lactophrys camelinus *Storer.* Synopsis Fishes N. A., p. 247.

Genus RHINESOMUS (*Sw.*)

RHINESOMUS YALEI *Gill.* "Trunk Fish."

Lactophrys Yalei *Storer.* Synopsis Fishes N. A., p. 246.

Family ORTHAGORISCOIDÆ (*Bon.*)

Subfamily ORTHAGORISCINÆ (*Bon.*)

Genus ORTHAGORISCUS (*Bloch.*)

ORTHAGORISCUS MOLA *Schreider.*

Orthagoriscus mola *Storer.* Synopsis Fishes N. A., p. 243.

Subfamily MOLACANTHINÆ *Gill.*

Genus MOLACANTHUS *Sw.*

MOLACANTHUS CARINATUS *Gill.*

Acanthosoma carinatum *Storer.* Synopsis Fishes N. A., p. 242.

Family DIODONTOIDÆ (*Rich.*)

Subfamily DIODONTINÆ (*Gill.*)

Genus DIODON *Linn.*

DIODON PILOSUS *Mitchill.*

Diodon pilosus *Storer.* Synopsis Fishes N. A., p. 240.

Subfamily TRIRHIZACANTHINÆ *Gill.*

Genus CHILOMYCTERUS *Bibron.*

CHILOMYCTERUS GEOMETRICUS *Kaup.*

Diodon maculo-striatus *Storer.* Synopsis Fishes N. A., p. 240.

CHILOMYCTERUS FULIGINOSUS *Gill.**

Diodon fuliginosus *Dekay.* Zoology of New York, Fishes, p. 324.
pl. iv., fig. 181.

Diodon maculo-striatus (young) *Storer*. Synopsis Fishes N. A., p. 240.

CHILOMYCTERUS VERRUCOSUS *Gill*.*

Diodon verrucosus *Storer*. Synopsis Fishes N. A., p. 240.

Family TETRODONTOIDÆ (Bon.)

Subfamily TETRODONTINÆ (Bon.)

Genus LAGOCEPHALUS Sw.

LAGOCEPHALUS LÆVIGATUS *Gill*.

Tetraodon lagocephalus (partim) *Storer*. Synopsis Fishes N. A., p. 241.

Tetraodon lævigatus *Storer*. Synopsis Fishes N. A., p. 241.

Tetraodon curvus (young) *Storer*. Synopsis Fishes N. A., p. 242.

Genus GASTROPHYSUS Müll.

GASTROPHYSUS TURGIDUS *Gill*.

Tetraodon turgidus *Storer*. Synopsis Fishes N. A., p. 241.

Order LOPHOBRANCHII Cuv.

Family SYNGNATHOIDÆ (Bon.)

Subfamily SYNGNATHINÆ (Bon.)

Genus SYNGNATHUS Linn.

SYNGNATHUS PECKIANUS *Storer*. "Pipe Fish."

Syngnathus peckianus *Storer*. Synopsis Fishes N. A., p. 238.

Subfamily HIPPOCAMPINÆ Bon.

Genus HIPPOCAMPUS Cuv.

HIPPOCAMPUS HUDSONIUS *Dekay*. "Sea Horse."

Hippocampus hudsonius *Storer*. Synopsis Fishes N. A., p. 239.

Subclass GANOIDEI (Ag.) Müller.

Order CHONDROSTEI (Müller.)

Family STURIONOIDÆ (Richardson.)

Subfamily ACIPENSERINÆ (Bon.)

Genus ACIPENSER Linn.

ACIPENSER OXYRHYNCHUS *Mitchill*. "Sturgeon."

Acipenser oxyrhynchus *Storer*. Synopsis Fishes N. A., p. 244.

Genus Huso Fitz and Heckel.

HUSO BREVIROSTRIS *Fitz. and Heckel*. "Sturgeon."

Acipenser brevirostris *Storer*. Synopsis Fishes N. A., p. 248.

Subclass ELASMOBRANCHII Bon.

Order *PLAGIOSTOMI* Cuv.

Suborder SQUALI (Müll. and Henle.) Gill.

Family SQUALOIDÆ (Bon.)

Subfamily SQUALINÆ (Bon.)

Genus SQUALUS (Linn.)

SQUALUS OBSCURUS *Lesueur*. ("Dusky Shark.")
Carcharias obscurus *Storer*. Synopsis Fishes N. A., p. 251.

SQUALUS MILBERTI *Bon*.

Carcharias (Prionodon) Milberti *Müll. and Henle*, Systematische Beschreibung der Plagiostomen, p. 38.

SQUALUS CÆRULEUS *Mitchill*.

Carcharias cæruleus *Storer*. Synopsis Fishes N. A., p. 251.

Lamna caudata (Dekay) *Storer*. Synopsis Fishes N. A., p. 252.

Genus APRIONODON Gill.

APRIONODON PUNCTATUS *Gill*.

Squalus punctatus *Mitchill*. Transactions of the Literary and Philosophical Society of New York, i. p. 485. (Not Dekay and *Storer*.)

Carcharias (Aprion)isodon, *Müll. and Henle*. Systematische Beschreibung der Plagiostomen, p. 32.

Genus SCOLIODON Müll. and Henle.

SCOLIODON TERRÆ-NOVÆ *Gill*.

Squalus (Carcharias) terræ-novæ *Richardson*. Fauna Boreali-Americana, iii. p. 289.

Species of Uncertain Genus.

CARCHARIAS ATWOODI *Storer*. Proceedings Boston Society of Nat. Hist., 1848, p. 72.

Family CESTRACIONTOIDÆ Gill.

Subfamily CESTRACIONTINÆ Gill.

Genus CESTRACION Klein.

CESTRACION SUBARCUATUS *Gill*. ("Hammer-headed Shark.")

Zygæna malleus *Storer*. Synopsis Fishes N. A., p. 256.

CESTRACION TIBURO *Gill*.*

Zygæna tiburo *Baird*. Ninth Annual Report of Smith. Inst. for 1854, p. *337.

Family MUSTELOIDÆ Girard.

Subfamily MUSTELINÆ Bon.

Genus MUSTELUS Art.

MUSTELUS CANIS *Dekay*. ("Dog Fish.")

Mustelus canis *Storer*. Synopsis Fishes N. A., p. 253.

Family LAMNOIDÆ Müller.

Subfamily ISURINÆ Gray.

Genus OXYRHINA Ag.

OXYRHINA DEKAYI *Gill.*

Lamna punctata Storer. Synopsis Fishes N. A., p. 252.
(Not *Squalus punctatus* Mitchell.)

Genus CARCHARODON Smith.*

CARCHARODON RONDELETTI *Müll. and Henle.**

Squalus (Carcharias) vulgaris Richardson. Fauna Boreali-Americana, iii. p. 288.

Subfamily CETORHININÆ Gill.

Genus CETORHINUS Blainville.

CETORHINUS MAXIMUS *Blainville.* ("Basking Shark.")

Selachus maximus Storer. Synopsis Fishes N. A., p. 254.

Subfamily ODONTASPIDINÆ Bon.

Genus EUGOMPHODUS Gill.

EUGOMPHODUS GRISEUS *Gill.*

Carcharias griseus Storer. Synopsis Fishes N. A., p. 252.

Species of Uncertain Genus.

CARCHARIAS LITTORALIS Storer. Synopsis Fishes N. A., p. 251.

SQUALUS AMERICANUS Mitchell. Transactions of the Literary and Philosophical Society of New York, i. p. 483.

Family ALOPECIOIDÆ Ag.

Subfamily ALOPECINÆ (Bon.)

Genus ALOPIAS Raf.

ALOPIAS VULPES Bon. ("Fox Shark," or "Thrasher.")

Alopias vulpes Storer. Synopsis Fishes N. A., p. 253.

Family SPINACOIDÆ (Rich.)

Subfamily SPINACINÆ (Bon.)

Genus ACANTHIAS (Risso.)

ACANTHIAS AMERICANUS Storer. ("Spiked Dog Fish.")

Acanthias Americanus Storer. Synopsis Fishes N. A., p. 254.

Genus CENTROSCYLLIUM Müll. and Henle.

CENTROSCYLLIUM FABRICII *Müll. and Henle.*

Squalus acanthias Fabricius. Fauna Grœnlandica, p. 126, No. 88.

Family SCYMNOIDÆ (Bon.)

Subfamily SCYMNINÆ (Bon.)

Genus SOMNIOSUS Les.

SOMNIOSUS MICROCEPHALUS *Gill.*

Squalus carcharias Fabricius. Fauna Grœnlandica, p. 127, No. 89.

SOMNIOSUS BREVIPINNA Les.* "Sleeper."

Scymnus brevipinna Storer. Synopsis Fishes N. A., p. 255.

Suborder RHINÆ Gill.

Family SQUATINOIDÆ (Bon.)

Subfamily SQUATININÆ (Bon.)

Genus RHINA Klein.

- RHINA DUMERILI* *Gill.* "Angel Fish."
Squatina Dumerili Storer. Synopsis Fishes N. A., p. 256.

Suborder PRISTES Gill.

Family PRISTOIDÆ Ag.

Subfamily PRISTINÆ (Bon.)

Genus PRISTIS Latham.

- PRISTIS ANTIQUORUM* *Latham.* "Saw Fish."
Pristis antiquorum Storer. Synopsis Fishes N. A., p. 257.

Suborder RAIÆ (M. & H.) Gill.

Family TORPEDINOIDÆ (Bon.)

Subfamily TORPEDININÆ (Bon.)

Genus NARCACION Klein.

- NARCACION OCCIDENTALE *Gill.* "Torpedo."
Torpedo occidentalis Storer. Synopsis Fishes N. A., p. 264.

Family RAIROIDÆ (Bon.)

Subfamily RAIAINÆ (Bon.)

Genus RAIÆ Linn.

- RAIÆ LÆVIS *Mitchill.* "Ray."
Raia lævis Storer. Synopsis Fishes N. A., p. 259.
- RAIÆ DIAPHANES *Mitchill.*
Raia diaphanes Storer. Synopsis Fishes N. A., p. 258.
- RAIÆ ERINACEA *Mitchill.*
Raia erinacea Storer. Synopsis Fishes N. A., p. 259.
- RAIÆ AMERICANA *Dekay.*
Raia Americana Storer. Synopsis Fishes N. A., p. 260.
- RAIÆ OCELLATA *Mitchill.**
Raia ocellata Storer. Synopsis Fishes N. A., p. 258.
- RAIÆ CHANTENAY *Lesueur.**
Raia chantenay Storer. Synopsis Fishes N. A., p. 260.
- RAIÆ RADIATA *Donovan.*
Raia fullonica Fabricius. Fauna Græniclandica, p. 125, No. 87.
- RAIÆ EGLANTERIA *Lesueur.**
Raia eglanteria Storer. Synopsis Fishes N. A., p. 260.

Family TRYGONOIDÆ (Bon.)

Subfamily TRYGONINÆ (Bon.)

Genus TRYGON Adanson.

TRYGON SAYI *Müll. and Henle*. "Sting Ray."
 Myliobatis Say *Storer*. Synopsis Fishes N. A., p. 262.

TRYGON HASTATA* *Storer*.
 Trygon hastata *Storer*. Synopsis Fishes N. A., p. 261.

Genus PTEROPLATEA Müll. and Henle.

PTEROPLATEA MACLURA *Müll. and Henle*.
 Trygon MacLura *Storer*. Synopsis Fishes N. A., 261.

Family MYLIOBATOIDÆ (Müll. and Henle.)

Subfamily MYLIOBATINÆ (Bon.)

Genus MYLIOBATUS Dum.

MYLIOBATUS BISPINOSUS *Storer*.
 Myliobatis acuta *Storer*. Synopsis Fishes N. A., p. 262.

Genus ÆTOBATUS Müller and Henle.

ÆTOBATUS NARINARI *Müll. and Henle*.
 Ætobatis guttata *Storer*. Catalogue of the Fauna of South
 Carolina, p. 13.

Genus RHINOPTERA Cuv.

RHINOPTERA QUADRILoba *Cuv*.
 Rhinoptera quadriloba *Storer*. Synopsis Fishes N. A., 263.

Species of Uncertain Genus.

MYLIOBATUS FREMENVILLEI *Storer*. Synopsis Fishes N. A., p. 262.

Family CEPHALOPTEROIDÆ (Bon.)

Subfamily CEPHALOPTERINÆ (Bon.)

Genus CERATOPTERA Müll. and Henle.

CERATOPTERA VAMPIRUS *Gill*. "Devil Fish."
 Cephaloptera vampirus *Storer*. Synopsis Fishes N. A., p. 264.
 Diabolichthys Elliottii *Holmes*. Proceedings of Elliott Society of
 Nat. Hist.

Subclass DERMOPTERI (Owen.)

Order HYPEROARTII (Bon.)

Family PETROMYZONTOIDÆ (Bon.)

Subfamily PETROMYZONTINÆ Gill.

Genus PETROMYZON (Linn.)

PETROMYZON AMERICANUS *Lesueur*. "Lamprey."
 Petromyzon americanus *Storer*. Synopsis Fishes N. A., p. 265.

PETROMYZON NIGRICANS *Lesueur*.

Petromyzon nigricans *Storer*. Synopsis Fishes N. A., p. 265.

Genus ICHTHYOMYZON *Girard*.

ICHTHYOMYZON APPENDIX *Girard*.

Petromyzon appendix *Storer*. Synopsis Fishes N. A., 266.

Order *HYPEROTRETI* (Bon.)

Family MYXINOIDÆ (Müller.)

Subfamily MYXININÆ (Bon.)

Genus MYXINE *Linn*.

MYXINE GLUTINOSA *Linn*.

Myxine glutinosa *Fabricius*. Fauna Grænlandica, p. 344, No. 334.

MYXINE LIMOSA *Girard*.*

Myxine limosa *Girard*. Proceedings of the Academy of Natural Sciences of Phila., 1858, p.

Order *PHARYNGOBRANCHII* (Müller.)

Family BRANCHIOSTOMOIDÆ (Bon.)

Subfamily BRANCHIOSTOMINÆ (Bon.)

Genus BRANCHIOSTOMA *Costa*.

BRANCHIOSTOMA sp.